

# INFORME TÉCNICO

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*DEPARTAMENTO DE OCEANOGRAFÍA BIOLÓGICA*

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**BIOMASA Y ESTRUCTURA DEL ZOOPLANKTON FRENTE A LA  
COSTA OCCIDENTAL DE BAJA CALIFORNIA DURANTE 2004  
(CRUCEROS IMECOCAL 0402, 0404, 0407, 0410)**

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WESTERN COAST OF BAJA CALIFORNIA DURING 2004  
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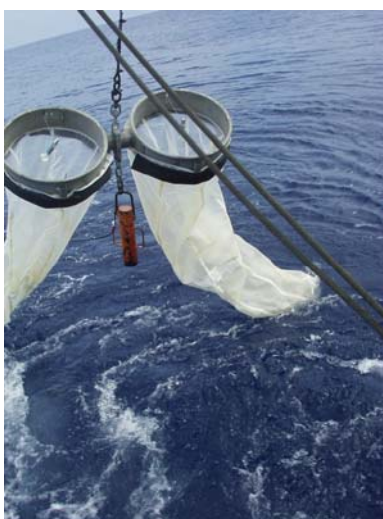
**CENTRO DE INVESTIGACIÓN CIENTÍFICA Y  
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**RESUMEN.-** En este reporte anual del macrozooplankton de la Corriente de California en su sector mexicano, se presentan datos de volumen desplazado, así como de abundancia y distribución de los principales grupos taxonómicos colectados en cuatro cruceros IMECOCAL realizados en 2004. Fue un año con altas biomásas. Las biomásas de febrero y abril de 2004 (medianas de 69 y 107  $\mu\text{l m}^{-3}$  respectivamente) fueron las máximas de invierno y primavera, dentro del periodo 1999-2004. La biomasa de julio 2004 (mediana = 102  $\mu\text{l m}^{-3}$ ) también fue alta, solo superada por la de julio 2002. Estos incrementos obedecieron a grandes abundancias en cinco de los principales taxa: de febrero a julio, las apendicularias fueron muy abundantes; además las salpas lo fueron en febrero; los sifonóforos en abril; los eufáusidos y heterópodos en julio. La abundancia de copépodos también aumentó respecto al año anterior. Se aprecia que en el contexto del periodo 1997-2004, existió una similitud entre 2002 y 2004 por las altas densidades de copépodos en la región central. No obstante hubo una diferencia entre ambos años en el acontecimiento de la productividad máxima, ya que en 2002 el pico de copépodos tuvo lugar en primavera, mientras que en 2004 ocurrió en verano. En medio de esos dos años, 2003 se situó como un año anómalamente pobre debido al efecto del Niño 2002-2003, el cual se manifestó más claramente en la región central.

**ABSTRACT.-** This is an annual report of the macrozooplankton in the Mexican sector of the California Current, containing data of displacement volume as well as abundance and distribution of the main taxonomic groups collected in four IMECOCAL cruises performed in 2004. This was a high biomass year. The biomass found in February and April of 2004 (medians of 69 and 107  $\mu\text{l m}^{-3}$  respectively) were the maxima from winter and spring, considering the period 1999-2004. The biomass in July 2004 (median = 102  $\mu\text{l m}^{-3}$ ) was also high, only surpassed by July 2002. These increments obeyed to great abundances in five of the main taxa: from February to July, the appendicularians were very abundant; besides, salps were abundant in February; siphonophores in April; euphausiids and heteropods in July. The abundance of copepods also increased in relation to the previous year. In the context of the period 1997-2004, was evident that 2002 and 2004 were similar years in the high copepod density in the central region. However, there was a difference between both years in the occurrence of the maximal productivity, because in 2002 the copepods peaked in spring, while in 2004 occurred in summer. In the middle of these two years, 2003 appears to be an anomalously poor year due to the effect of the 2002-2003 El Niño, which was affecting more clearly the central region.

## 1. INTRODUCCION

El programa Investigaciones Mexicanas de la Corriente de California (IMECOCAL) fue creado con el fin de monitorear el sector mexicano de la Corriente de California. Dicho sector se extiende por poco más de 600 millas náuticas a lo largo de la península de Baja California y 80% de su área (24-32°N) es monitoreada trimestralmente por los cruceros IMECOCAL (Fig. 1).

## 1. INTRODUCTION

The IMECOCAL program (Spanish acronym of the Mexican investigations of the California Current) was created to monitor the Mexican sector of the California Current. This sector extends by around 600 nautical miles along the Baja California peninsula, and 80% of its area (24-32°N) is monitored by the IMECOCAL cruises in every season of the year (Fig. 1).

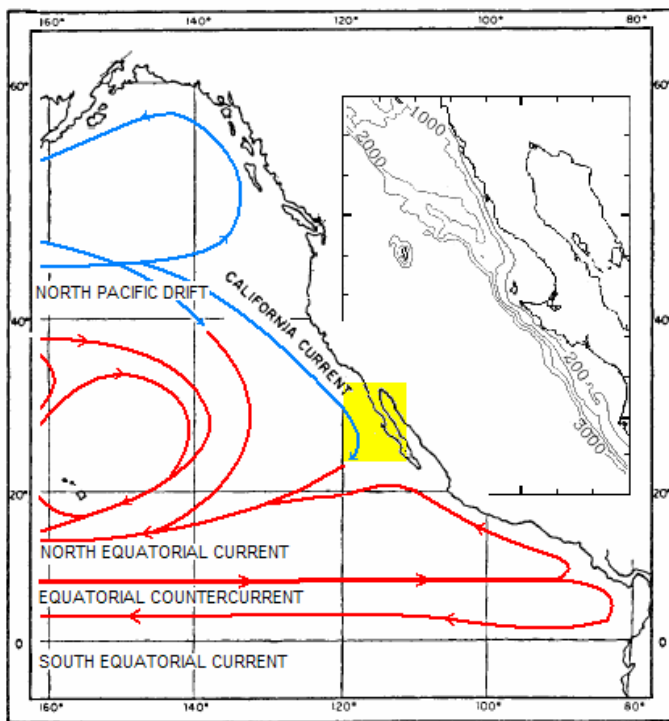


Figura 1. Corrientes del Pacífico Norte y Ecuatorial (tomadas de Svedrup *et al.* 1942). Las líneas azules (rojas) ilustran las corrientes frías (cálidas). El área de estudio está en amarillo, ampliada a la derecha para mostrar la batimetría (m).

Figure 1. Currents of the North and Equatorial Pacific (after Svedrup *et al.* 1942). Blue (red) lines show the cold (warm) currents. The study area is in yellow, enlarged at right to display bathymetry (m).

El Sistema de la Corriente de California se compone de tres corrientes básicas. La Corriente de California lleva agua fría de baja salinidad hacia el sur, mientras que las contracorrientes llevan agua más salina. La Contracorriente Subsuperficial de California fluye por la pendiente continental y la Contracorriente Costera por la costa. La fuerza e interacción dinámica de estas corrientes determina la productividad biológica del sistema. Por esta razón, la colecta de material biológico durante los cruceros IMECOCAL lleva aparejada la

The California Current System is composed of three basic currents. The California Current transports cool and low salinity water to the south, while the countercurrents carry more saline water. The California Undercurrent flows along the continental slope, and the Coastal Countercurrent by the coast. The strength and dynamic interaction of these currents determine the biological productivity of the system. Therefore, the biological sampling during the IMECOCAL cruises is narrowly coupled to physicochemical measurements of the water column.

realización de mediciones fisicoquímicas de la columna de agua, estrechamente acopladas.

La posición y distancia entre las estaciones de muestreo de los cruceros IMECOCAL sigue el protocolo del programa estadounidense CALCOFI (California Cooperative Oceanic Fisheries Investigations). Esto posibilita una comparación objetiva con datos históricos generados por dicho programa en la región de Baja California durante 1951-1985. Por otro lado, al mantenerse la escala espacio temporal, también es posible establecer contrastes con el monitoreo contemporáneo de CALCOFI en el sector de California.

En el presente reporte presentamos resultados preliminares de zooplancton de las muestras colectadas con redes bongo durante los cruceros IMECOCAL de 2004. Con ello se ponen a disposición de la comunidad científica datos de volumen desplazado de zooplancton, así como de abundancia de grupos funcionales durante un ciclo estacional.

El año 2004 fue similar al año anterior en cuanto a la presencia de agua subártica en la capa superior del mar y ligeras anomalías positivas de temperatura (Fig. 2), debido a influencias antagónicas entre esta masa de agua proveniente del norte y un débil El Niño, que afectó al Pacífico central durante 2002-2004 (<http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html>).

A pesar de que las concentraciones de clorofila continuaron siendo bajas durante 2004, los volúmenes de zooplancton fueron altos, como se muestra en el presente reporte. También se describe como se comparan estos valores con el periodo 1951-1984.

Los datos de biomasa de zooplancton de cruceros IMECOCAL anteriores (1997-2003) también están disponibles en reportes en el sitio <http://imecocal.cicese.mx/texto/prod/tecnic.htm>.

The position and distance among the sampling stations of the IMECOCAL cruises follows the protocol of the North American program CALCOFI (California Cooperative Oceanic Fisheries Investigations). This allows an objective comparison with historical data generated by that program in the region off Baja California during 1951-1985. Besides, the use of the same temporal-space scale allows the contrast with the contemporaneous sampling of CALCOFI in the sector off California.

The contribution of the present report is to present preliminary data of the zooplankton collected with bongo nets during the IMECOCAL cruises of 2004. With this we make available to the scientific community data of zooplankton volume as well as abundance of functional groups during a seasonal cycle.

The year 2004 was similar to the year before by the presence of subarctic water in the upper sea layer and lightly positive temperature anomalies (Fig. 2), due to opposed influences from this water mass coming from north, and a weak El Niño affecting the central Pacific during 2002-2004 (<http://www.cdc.noaa.gov/people/klaus.wolter/MEI/mei.html>).

Despite of chlorophyll concentrations continued being low during 2004, the zooplankton volumes were high, as will be describe in the present report. These values will be also compared with the period 1951-1984.

Zooplankton biomass data of the previous IMECOCAL cruises (1997-2003) are also available in technical reports, at the web site <http://imecocal.cicese.mx/texto/prod/tecnic.htm>.

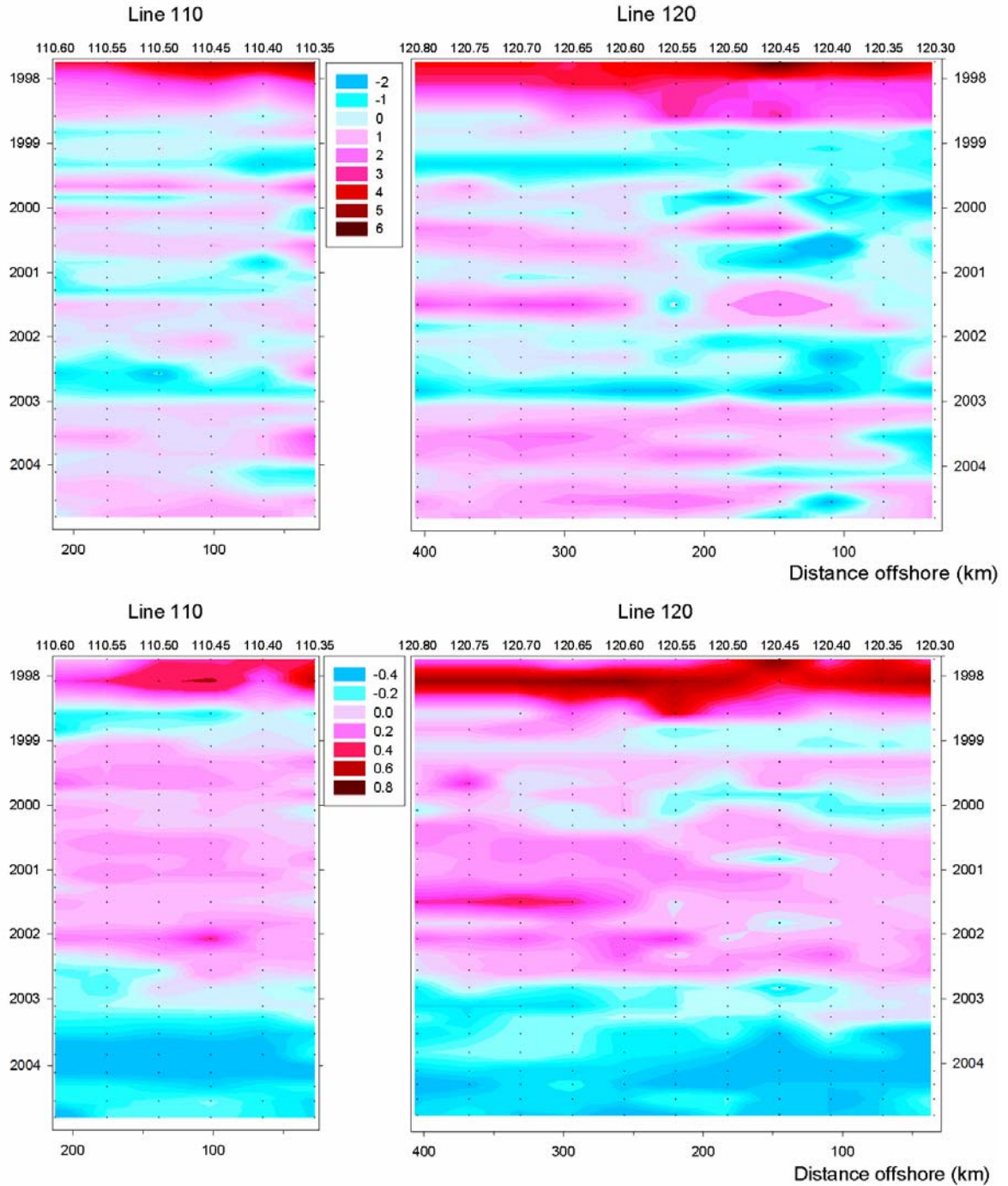


Figura 2. Diagramas de distancia contra tiempo a 10 m de profundidad basados en anomalías de temperatura (°C) (paneles superiores) y salinidad (paneles inferiores). Los transectos son perpendiculares a la costa frente a Punta Baja (Línea 110) y Punta Eugenia (Línea 120). Anomalías estimadas por  $X_i - \bar{X}$ , donde  $X_i$  es el valor en la  $i$ -ésima estación y  $\bar{X}$  es la media de 1950-1978 en dicha estación. (Las medias históricas fueron tomadas de Lynn *et al.*, 1982).

Figure 2. Time-distance plots at 10 m depth based in temperature (°C) (upper panels) and salinity anomalies (lower panels). The transects are perpendicular to the coast off Punta Baja (Line 110) and Punta Eugenia (Line 120). Anomalies estimated by  $X_i - \bar{X}$ , where  $X_i$  is the value in the station  $i$  and  $\bar{X}$  is the seasonal mean of 1950-1978 in that station. (Seasonal means taken from Lynn *et al.*, 1982).



## 1.1 Objetivos

- Proporcionar datos de biomasa de zooplancton y abundancia por grandes grupos taxonómicos de los cruceros IMECOCAL 0402, 0404, 0407 y 0410.
- Ilustrar los cambios estacionales en la distribución de biomasa y de los grupos más abundantes del zooplancton durante 2004.
- Describir brevemente las tendencias observadas en biomasa y estructura del zooplancton en el contexto de datos previos en el área de Baja California.

## 2. MÉTODOS

### 2.1 Colecta y preservación de muestras

Las muestras de zooplancton fueron colectadas a bordo del B/O *Francisco de Ulloa* durante cuatro periodos del 2004:

- 30 de enero a 18 de febrero (0402)
- 18 de abril al 6 de mayo (0404)
- 9 al 29 de julio (0407)
- 9 al 27 de octubre (0410)

Se realizaron arrastres oblicuos con red bongo de 71 cm de diámetro de boca, siguiendo a Smith y Richardson (1977). Se largaron 300 m de cable con una inclinación de 45°. El ángulo se registró cada 10 m durante el ascenso de la red y su promedio sirvió para determinar la profundidad de arrastre. En estaciones someras el lance se realizó a partir de 10 m arriba del fondo marino. La luz de malla de ambas redes fue de 500 µm. Se colocó un flujómetro digital General Oceanics frente a la boca de la red para estimar el volumen de agua filtrada y se mantuvo una velocidad constante de 2 nudos. El plancton se preservó en formol al 4% neutralizado con borato de sodio.

En total se colectaron 329 muestras (Fig. 3). En las Tablas 1-4 se muestran los datos técnicos de los arrastres de zooplancton, así como los datos de volumen desplazado.

## 1.1 Objectives

- To provide data of zooplankton biomass and abundance of the main taxonomic groups during the IMECOCAL cruises 0402, 0404, 0407, and 0410.
- To illustrate seasonal changes in distribution of zooplankton biomass and the most abundant taxa during 2004.
- To describe briefly the observed tendencies in zooplankton biomass and structure in the context of previous data in the Baja California area.

## 2. METHODS

### 2.1 Samples collection and preservation

The zooplankton samples were collected on board of the R/V *Francisco de Ulloa* during four periods of 2003:

- January 30 to February 18 (0402)
- April 18 to May 6 (0404)
- July 9-29 (0407)
- October 9-27 (0410)

Oblique tows were done with a bongo net of 71 cm of diameter, following to Smith & Richardson (1977). The wire let out was 300 m with an angle inclination of 45°. The angle was recorded each 10 m during the ascent of the net, and the average was used to determine the tow depth. In shallow stations the tow was done from a depth of 10 m above the sea bottom. Both nets were of 500 µm of mesh width. A General Oceanics flowmeter was placed in front of the net to estimate volume of filtered water, and the velocity was maintained constant to 2 knots. The plankton was preserved with 4% formalin buffered with sodium borate.

The total collected samples were 329 (Fig. 3). Technical data of the zooplankton tows are shown in Tables 1-4, as well as data of displacement volume.

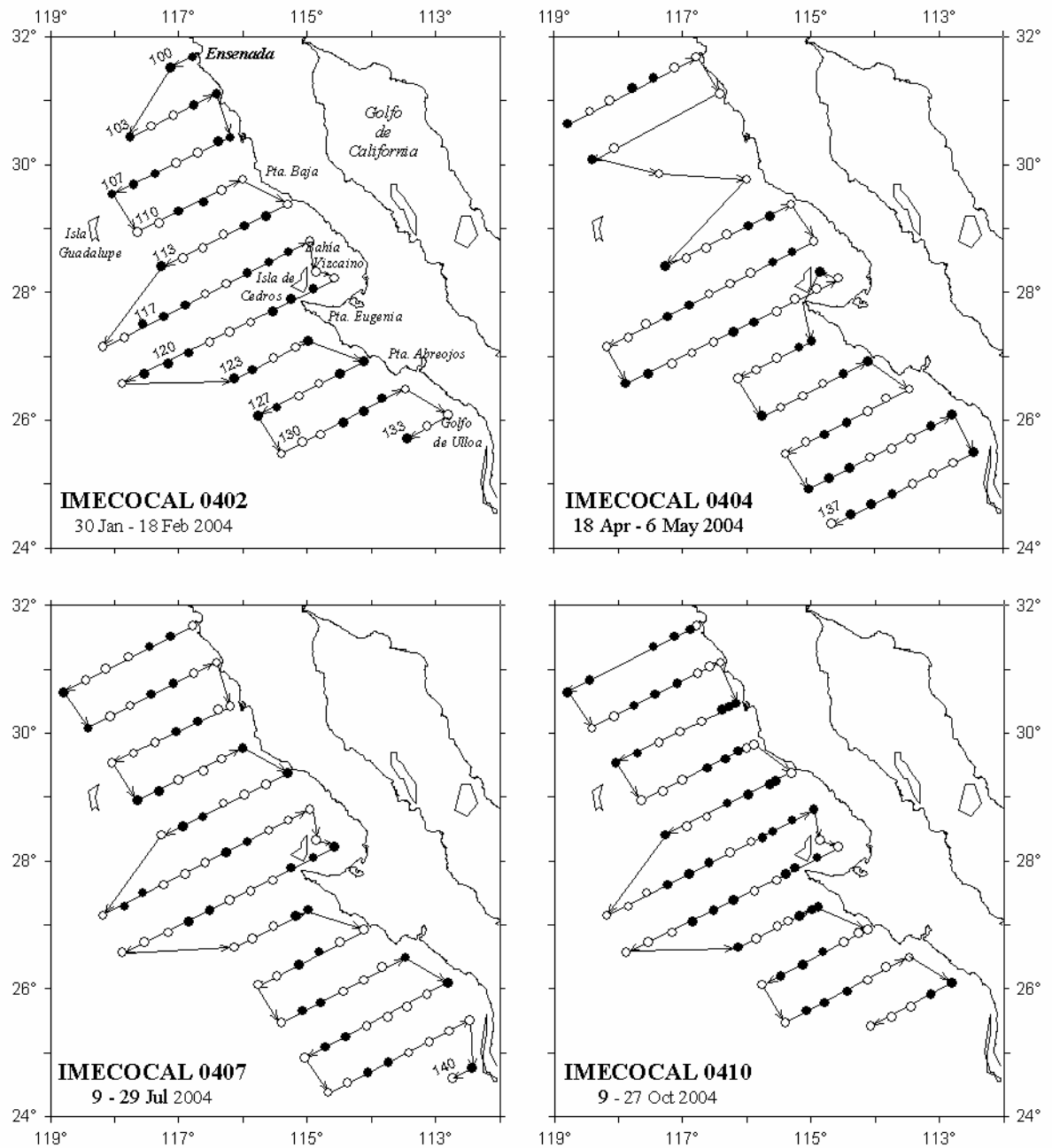


Figura 3. Estaciones de colecta durante los cruceros IMECOCAL 0402, 0404, 0407 y 0410. Los círculos sombreados (claros) representan estaciones nocturnas (diurnas); se indican los números de línea-transecto.

Figure 3. Sampling stations during the IMECOCAL cruises 0402, 0404, 0407 and 0410. Shaded (open) circles are stations occupied at night (day); the numbers of transect-lines are indicated.

## 2.2 Análisis de laboratorio

El análisis de las muestras consistió en la medición de la biomasa del zooplankton, así como en el conteo de los organismos a nivel de grupos taxonómicos mayores. La medición de biomasa fue realizada por el método de volumen desplazado siguiendo a Kramer *et al.* (1972). Primeramente se separaron los organismos con volumen mayor a 5 ml. El material biológico restante se vertió en una probeta graduada de 100, 250 o 500 ml de capacidad (según la cantidad de plancton en la muestra), y se ajustó el volumen hasta la marca superior. Posteriormente, el contenido fue transferido a otra probeta de las mismas dimensiones, con un tamiz de 333  $\mu\text{m}$  ajustado a un embudo en la parte superior, para drenar el plancton. Se registró el volumen cuando el escurrimiento se redujo a una gota ocasional. La diferencia de estas mediciones se reporta como biomasa chica. La suma de esta y el volumen de los organismos grandes (previamente removidos) se registraron como biomasa total.

Posteriormente se cuantificó la abundancia del zooplankton en 152 muestras, que correspondieron a aquellas recolectadas en horario nocturno. El conteo se hizo en una fracción de  $\frac{1}{8}$ ,  $\frac{1}{16}$  o  $\frac{1}{32}$  de la muestra original, obtenida con un separador Folsom. Fracciones más pequeñas se usaron en 7% de las muestras, debido a la gran cantidad de plancton; mientras que en muestras bajas en plancton (4%) se analizaron fracciones  $\geq \frac{1}{4}$ . Los organismos contenidos en la submuestra fueron identificados a grandes grupos taxonómicos y contados con un microscopio estereoscópico. En promedio se contaron 1411 organismos por submuestra.

## 2.3 Tratamiento de los datos

El volumen y la abundancia de plancton se estandarizaron por volumen de agua filtrada, y se reportan en unidades de  $\mu\text{l m}^{-3}$  e  $\text{ind m}^{-3}$  respectivamente. Se elaboraron mapas de distribución de biomasa de zooplankton y de distribución de abundancia de los principales grupos taxonómicos. Los mapas de biomasa se

## 2.2 Laboratory analysis

The analysis of samples consisted in the measurement of the zooplankton biomass, and the counting of the organisms at level of major taxa. The measurement of biomass was done by the method of displacement volume following to Kramer *et al.* (1972). First, the organisms with volume higher than 5 ml were removed. The rest of biological material was poured in a graduated cylinder of 100, 250 or 500 ml (depending of the amount of plankton in each sample), and the volume was adjusted to superior tick. Further, the content was transferred to other graduated cylinder of the same dimensions, with a 333  $\mu\text{m}$  draining cone in a funnel at the top to retain the plankton. The volume was recorded when the leakage was reduced to an occasional drop. The difference between these two measures is reported as small biomass. The volume of the large organisms removed plus the small biomass were recorded as total biomass.

After, the quantification of abundance was done in 152 nighttime samples. Counting was done on  $\frac{1}{8}$ ,  $\frac{1}{16}$ , or  $\frac{1}{32}$  fraction of the sample, obtained with a Folsom splitter. Smaller fractions were used in 7% of the samples, due to the high amount of plankton; while in samples with scarce plankton (7%) the analyzed fraction was  $\geq \frac{1}{4}$ . The organisms contained in the subsample were identified to major taxa and counted with a stereoscopic microscope. The mean number counted per subsample were 1411 organisms.

## 2.3 Data processing

Plankton volume and abundance were standardized per volume of water filtered, and are reported in units of  $\mu\text{l m}^{-3}$  and  $\text{ind m}^{-3}$  respectively. Charts of zooplankton biomass distribution were done, as well as abundance distribution for the main taxa. The biomass charts were done with the software SIGMAPLOT 7, using the inverse distance for contour interpolation.

realizaron con el programa SIGMAPLOT 7, usando la distancia inversa para interpolación de contornos. Posteriormente se retocaron, para asegurar que los valores reales cayeran en los intervalos correspondientes. La distribución de abundancia de los grupos taxonómicos se presenta en forma puntual debido a la irregularidad de la malla al seleccionar solo las muestras nocturnas.

Debido a la falta de normalidad de los datos, se prefiere usar la mediana de abundancia, o bien la media geométrica, con el fin de mostrar los cambios en estructura del zooplancton a través de la serie de tiempo IMECOCAL. Para ello se agruparon las estaciones en dos regiones:

- 1) Norte ..... líneas 100 a 110
- 2) Central .... líneas 113 a 137

La delimitación de estas regiones está basada en el criterio de que Punta Baja (30°N) es el límite entre dos grandes regiones de la Corriente de California (U.S. GLOBEC, 1994). La región norte forma parte del gran remolino ciclónico del Sur de California (abarca de Point Conception a Punta Baja). Dicha región presenta una marcada estratificación, mínimo forzamiento por viento y surgencias débiles. En la extensa región central el viento y las surgencias son moderados pero persistentes todo el año, y hay actividad a mesoescala. La influencia de agua del Pacífico ecuatorial es mayor, principalmente en otoño-invierno.

Datos de volumen desplazado de los cruceros CalCOFI del periodo 1951-1984 se utilizaron para ilustrar cambios de largo plazo en la biomasa del zooplancton. Se seleccionaron datos de las líneas 100 a 137, de cruceros realizados en enero (o febrero), abril (o mayo), julio (o agosto) y octubre (o septiembre). Se calcularon medianas por crucero, así como las medias logarítmicas por estaciones del año, para estimar anomalías de baja frecuencia. Esto es, sustrayendo la media de largo plazo de invierno, primavera, verano u otoño, según sea el caso.

Further, were retouched, to make sure that real values fell in the corresponding intervals. Abundances distributions of taxa are presented punctually due to the irregularity of the grid when only nighttime samples are selected.

Due to the biased distribution of data, medians of abundance, or else geometric means, were calculated for the main taxa to show changes in zooplankton structure through the IMECOCAL time-series. Stations were grouped in two regions:

- 1) North ..... lines 100 to 110
- 2) Central ..... lines 113 to 137

Delimitation of these regions takes to Punta Baja (30°N) as the limit between two large regions of the California Current (U.S. GLOBEC, 1994). The north region is part of the Southern California Eddy (from Point Conception to Punta Baja). That region presents a marked stratification, minimum wind forcing and weak upwelling. In the extended central region, the wind and upwelling are moderate but persistent year round, and there is mesoscale activity. The influence of Pacific equatorial water is higher, mainly in fall-winter.

Data of displacement volume from CalCOFI cruises of the period 1951-1984 were used to illustrate long-term changes of zooplankton biomass. Data of lines 100 to 137 were selected, from cruises performed on January (or February), April (or May), July (or August), and October (or September). Medians per cruise were calculated, as well as seasonal logarithmic means, to estimate low frequency anomalies. That is, removing the long-term mean of winter, spring, summer or fall in each case.

### 3. BIOMASA DEL ZOOPLANKTON

#### 3.1 Biomasa del zooplancton durante 2004

Las dos mediciones de biomasa total y chica (Tablas 1-4) difieren en 17-30% de las muestras por crucero, debido a la presencia de organismos grandes (Tabla 5). Los de mayor ocurrencia y volumen fueron las langostillas (*Pleuroncodes planipes*). Otros especímenes grandes de regular ocurrencia fueron los pterópodos del género *Corolla* (muchos de ellos desintegrados), los heterópodos y estomatópodos. La incidencia de los primeros fue mayor en invierno y de los dos últimos en verano.

Siguiendo la medida más conservadora que es la biomasa chica, la mediana de febrero ( $69 \mu\text{l m}^{-3}$ ) fue la más baja del año. En abril se incrementó a  $107 \mu\text{l m}^{-3}$  y se mantuvo muy similar en julio. Las cifras de febrero y abril fueron record para las temporadas invierno-primavera del periodo 1999-2004. La de julio fue la segunda más alta del periodo 1998-2004. La biomasa volvió a descender en octubre 2004 ( $77 \mu\text{l m}^{-3}$ ).

Si las medianas se calculan limitando los datos a colectas nocturnas, las medianas siguieron la misma tendencia estacional. La estimación sería de 9 a 17% mas alta que cuando se consideran todas las muestras.

Las biomasas más bajas ( $<50 \mu\text{l m}^{-3}$ ) correspondieron a la mayoría de las estaciones diurnas de los cruceros 0402 y 0410 (Fig. 4). En contraste, las máximas biomasas ocurrieron en estaciones cercanas a la costa, principalmente en los cruceros 0404 y 0407 (Fig. 4).

En enero 2004 (Tabla 1) la zona de plataforma costera, a diferencia de años previos, mostró biomasas muy elevadas. Algunas sobrepasaron los  $1000 \mu\text{l m}^{-3}$  debido a la presencia de numerosas salpas. En la zona oceánica de la región central la biomasa también estuvo por arriba de lo habitual para el invierno.

### 3. ZOOPLANKTON BIOMASS

#### 3.1 Zooplankton biomass during 2004

The two measurements of total and small biomass (Tables 1-4) differed in 17-30% of the samples per cruise, due to the presence of large size organisms (Table 5). The red crabs (*Pleuroncodes planipes*) had the highest occurrence and volumes. Other large specimens of regular occurrence were pteropods of the genus *Corolla* (many of them disintegrated), heteropods, and stomatopods. The incidence of the first was higher in winter and of the two last in summer.

Following the most conservative measurement or small biomass, the February median ( $69 \mu\text{l m}^{-3}$ ) was the lowest of the year. In April, the median increased to  $107 \mu\text{l m}^{-3}$  and remained very similar in July. The February and April magnitudes were record for the winter-spring of the period 1999-2004. The July value was the second highest for 1998-2004. The biomass decrease again in October 2004 ( $77 \mu\text{l m}^{-3}$ ).

If the medians were calculated taking only the nighttime samples, the medians followed the same seasonal trend. The estimation would be from 9 to 17% higher than using all samples.

The lowest biomass ( $50 \mu\text{l m}^{-3}$ ) corresponded to most of the day time stations of the cruises 0402 and 0410 (Fig. 4). In contrast, the maximal biomass occurred in stations near the coast, mainly in cruises 0404 and 0407 (Fig. 4).

In January 2004 (Table 1) the coastal shelf, differently to previous years, showed high biomass. Some shallow stations surpassed  $1000 \mu\text{l m}^{-3}$ , due to the presence of many salps. In the oceanic zone of the central region, the biomass was also above of the usual for winter.

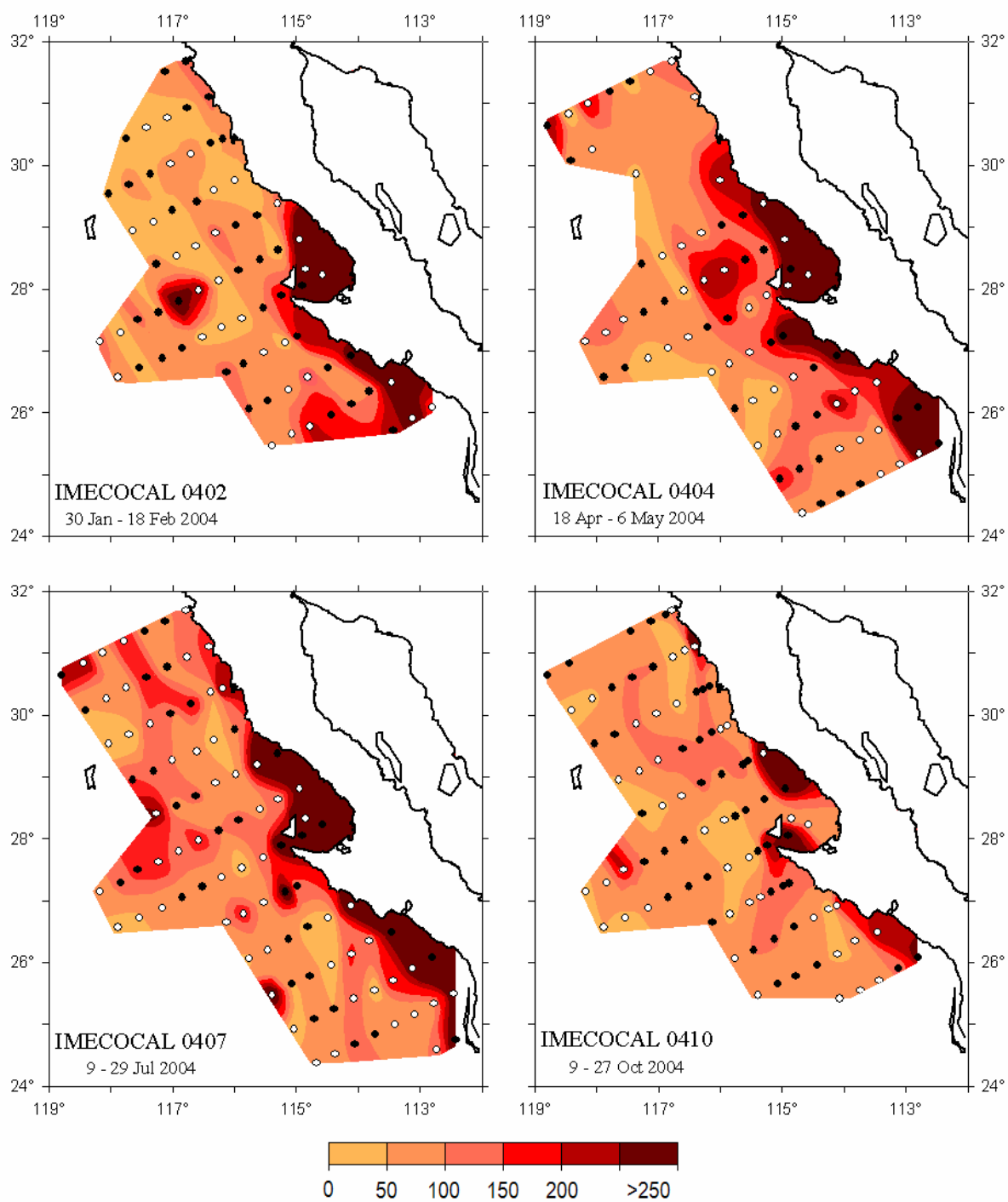


Figura 4. Volumen desplazado de zooplancton ( $\mu\text{l m}^{-3}$ ) durante 2004.

Figure 4. Displacement volume of zooplankton ( $\mu\text{l m}^{-3}$ ) during 2004.

La franja costera continuó presentando alta biomasa en abril (Fig. 4, Tabla 2) con valores superiores a  $500 \mu\text{l m}^{-3}$  en varias estaciones someras. Esta productividad se debió a grandes abundancias de copépodos y eufáusidos principalmente.

En julio 2004 (Tabla 3) la distribución de biomasa fue similar a la observada en abril (Fig. 4). Los valores máximos también fueron causados por copépodos y eufáusidos.

En octubre solo el 9% de las muestras presentó un volumen de zooplancton superior a  $200 \mu\text{l m}^{-3}$  (Fig. 4, Tabla 4). Aunque Bahía Vizcaíno y el Golfo de Ulloa continuaron presentando algunas estaciones ricas en plancton, la biomasa sufrió un descenso notable, considerando la riqueza extraordinaria de los anteriores cruceros del año.

### **3.2 Biomasa de zooplancton en el contexto del periodo 1951-1984 (cruceros CalCOFI)**

Los datos biomasa de zooplancton en aguas de Baja California durante el periodo 1951-1984 indican que la región norte era ligeramente más rica que la región central durante primavera y verano. Únicamente en otoño se observa la inversión de esta tendencia. Sin embargo, a través del periodo reciente de 1997-2004 se ha observado una clara supremacía de la región central, que obedece grandemente a altas biomasa de las estaciones de la plataforma continental. Esto quiere decir que la productividad secundaria en la región norte podría haber disminuido en el periodo reciente.

En efecto, la mayoría de las medias geométricas de los cruceros IMECOCAL han sido inferiores a las del periodo 1951-1984 en la región norte, y arrojan por tanto anomalías negativas (Fig. 5). La magnitud de las anomalías negativas fue variable, pero en general resultaron ligeramente mayores en invierno y primavera. Unos cuantos cruceros presentaron anomalías débilmente positivas, entre ellos el crucero 0404.

The coastal fringe continued with high biomass in April, surpassing  $500 \mu\text{l m}^{-3}$  in several shallow stations (Fig. 4, Table 2). This productivity obeyed mainly to high abundance of copepods and euphausiids.

In July 2004 (Table 3) biomass distribution was similar to that observed in April (Fig. 4). The maximal values were also caused by copepods and euphausiids.

In October, only 9% of the zooplankton volumes were higher than  $200 \mu\text{l m}^{-3}$  (Fig. 4, Table 4). Though Vizcaino Bay and the Gulf of Ulloa continued presenting some stations rich in plankton, the biomass suffered a substantial decrease, considering the extraordinary richness in previous cruises of the year.

### **3.2 Zooplankton biomass in the context of the period 1951-1984 (CalCOFI cruises)**

The data of zooplankton biomass in waters off Baja California during the period 1951-1984 indicated a north region lightly richer than the central region during spring and summer. Only in fall the trend was inverted. However, through the recent period of 1997-2004 a clear preponderance of the central region has been observed mainly due to the stations of the continental shelf. This means the secondary production in the north region could have decreased in the recent period.

In fact, most of the geometric means from IMECOCAL cruises has been lower than the 1951-1984 seasonal means in the north region, giving therefore negative anomalies (Fig. 5). The magnitude of the negative anomalies was variable, but in general resulted lightly higher in winter and spring. Some few cruises presented weakly positive anomalies, the cruise 0404 among them.

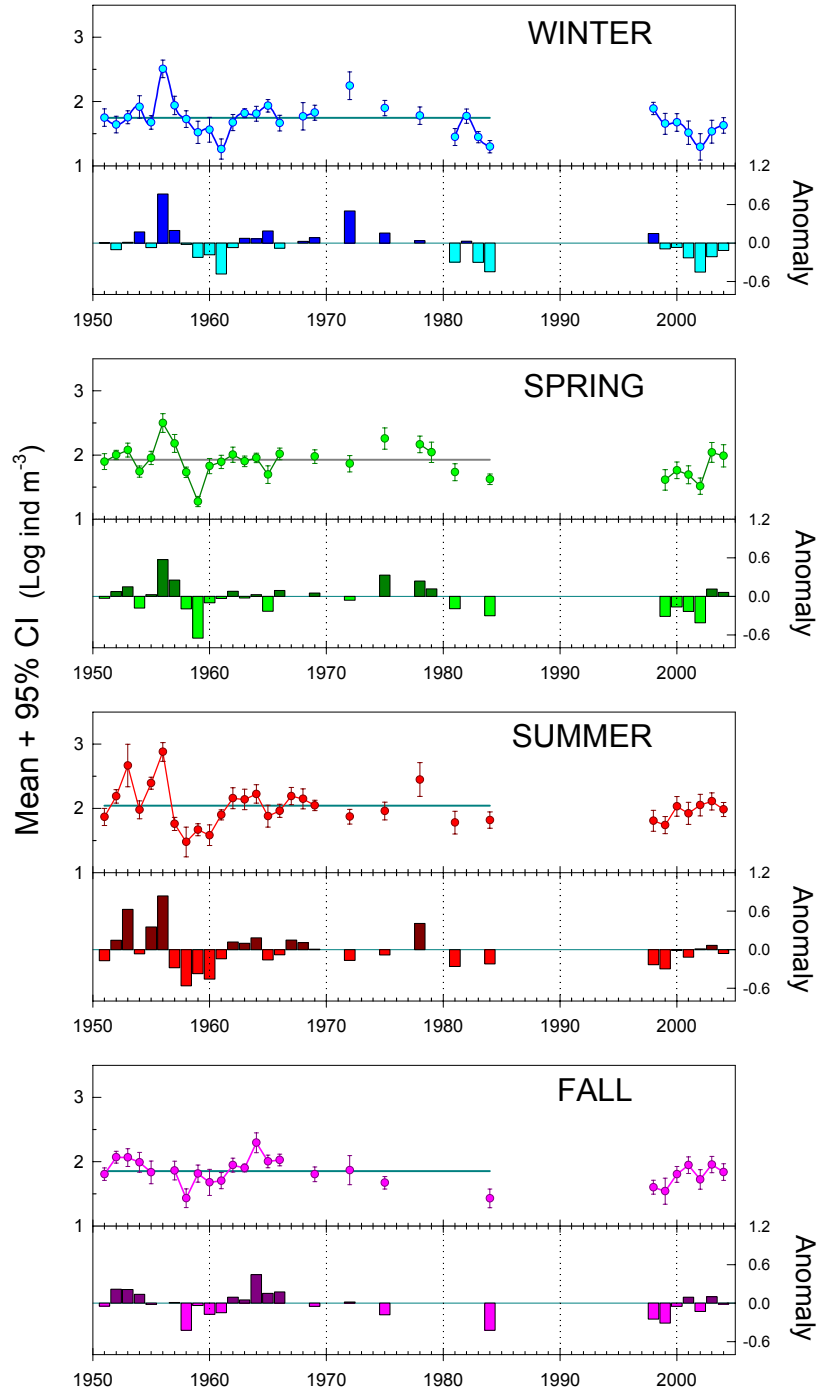


Figura 5. Variación histórica de la biomasa zooplanctónica en la región norte (líneas 100-110). Los datos de 1951-1984 son de los cruceros CalCOFI. Las anomalías se calcularon restando la media estacional del periodo 1951-1984. Datos transformados a logaritmos.

Figure 5. Zooplankton biomass variability in the northern region (lines 100-110). Data for 1951-1984 are from CalCOFI cruises. Anomalies were calculated removing the seasonal mean for the period 1951-1984. Data transformed to logarithms.



En la región central la biomasa del zooplankton de los cruceros IMECOCAL ha sido muy similar a la del periodo 1951-1984 (Fig. 6). Esto se refleja en la baja magnitud de las anomalías y su carácter mayormente positivo durante primavera y verano. Sin embargo, en invierno ha habido grandes fluctuaciones en biomasa, con anomalías negativas en algunos casos y fuertemente positivas en otros. Por ejemplo, la anomalía del crucero 0402 fue igual a 0.3. Su antilogaritmo es 2.1 y representa el cociente entre la media geométrica de febrero 2004 y la media invernal de 1951-1984. Por tanto, la biomasa observada en enero 2004 dobla la del periodo histórico.

Abril y julio de 2004 también arrojaron anomalías positivas de menor magnitud. Dichas anomalías indican que la media geométrica de abril 2004 fue 58% superior a la media primaveral de 1951-1984. Un resultado parecido se encuentra para julio 2004, cuya media geométrica fue 50% mayor que la media estival de 1951-1984.

En contraste, la biomasa de octubre 2004 en la región central presentó una anomalía débilmente negativa en relación a la norma del otoño a través de 1951-1984.

#### 4. ABUNDANCIA POR GRUPOS TAXONÓMICOS

El número total de organismos en los conteos de las muestras nocturnas arrojó medianas de 48, 43, 79 y 34 ind  $m^{-3}$ , para febrero, abril, julio y octubre de 2004 respectivamente. Estos valores siguen más o menos la tendencia observada en biomasa, excepto para abril, ya que mientras la biomasa mediana fue del mismo nivel en abril y julio, la abundancia total no lo fue.

La mediana de febrero 2004 fue alta dentro del amplio rango desplegado por los cruceros invernales IMECOCAL (17-63 ind  $m^{-3}$ ). Contrasta con el invierno de 2003, en el cual solo 38% de las muestras superaron los 20 ind  $m^{-3}$ , mientras que en febrero de 2004 lo hicieron el 80% (Tabla 6).

In the central region, the zooplankton biomass from the IMECOCAL cruises has been similar to that of the period 1951-1984 (Fig. 6). This is evident by the low magnitude of the anomalies and these have been mostly positive during spring and summer. However, in winter the biomass has been more variable, with negative anomalies in some cases and strongly positive in others. For example, the anomaly in the cruise 0402 was equal to 0.3, converted to its antilogarithm results 2.1. This is the ratio between the January 2004 geometric mean and the long-term winter mean (1951-1984). Therefore, the observed biomass in January 2004 was twofold of the long-term mean.

April and July of 2004 also showed positive anomalies of lower magnitude. Those anomalies indicated that the April geometric mean was 58% higher to the spring mean from 1951-1984. A similar result was found for July 2004, which geometric mean was 50% higher than the summer mean of 1951-1984.

In contrast, the biomass of the central region during October 2004 presented a weak negative anomaly in relation to the autumn norm from 1951-1984.

#### 4. ABUNDANCE OF TAXONOMIC GROUPS

The total number of organisms counted in nighttime samples resulted in medians of 48, 43, 79, and 34 ind  $m^{-3}$ , from February, April, July, and October of 2004 respectively. These values followed more or less the tendency observed in biomass, excepting April, since the median biomass was similar to July, but not the abundance.

The median in February 2004 was high for the winter range of the IMECOCAL cruises (17-63 ind  $m^{-3}$ ). This contrasted with winter 2003, when only 38% of the samples surpassed 20 ind  $m^{-3}$ , while in February 2004 were 80% (Table 6).

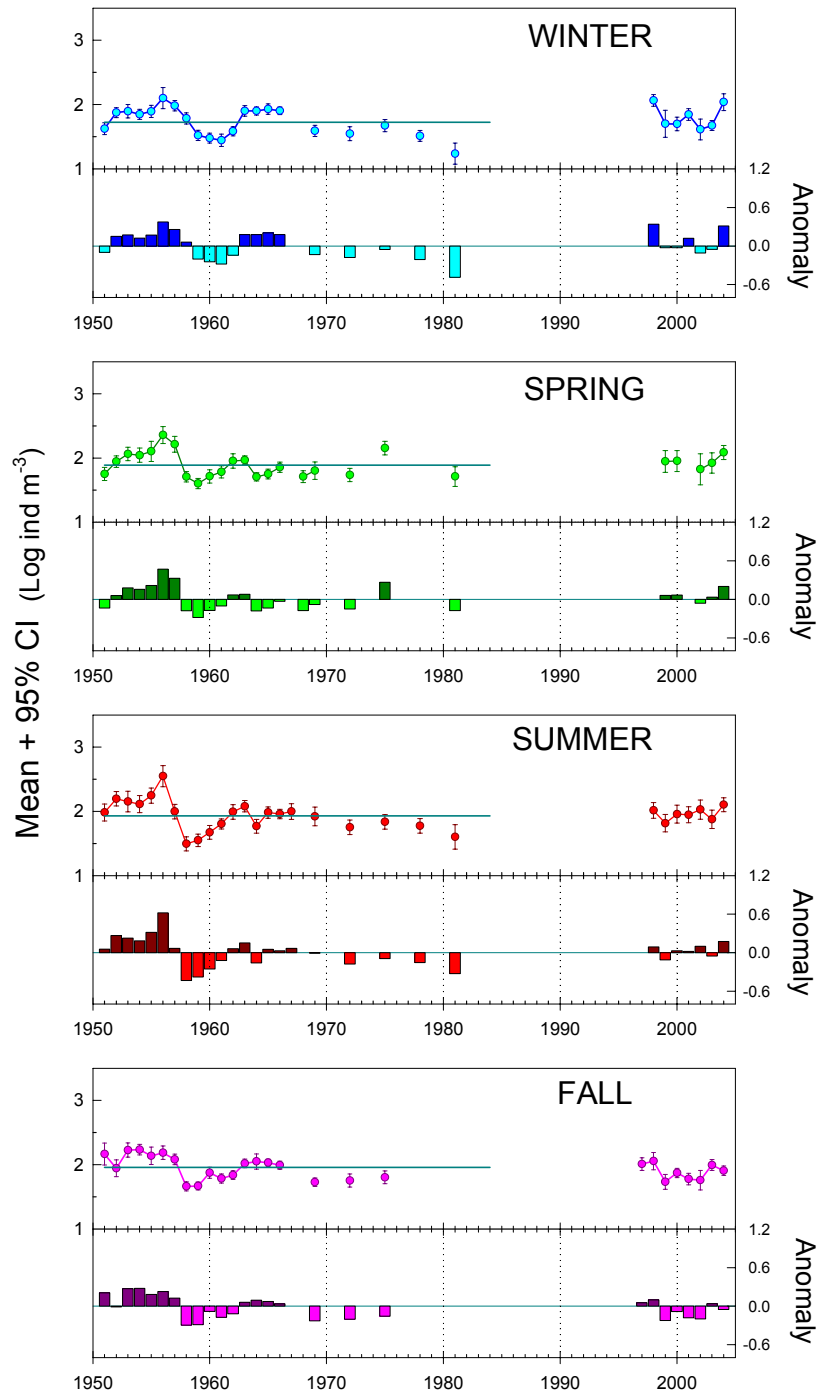


Figura 6. Variación histórica de la biomasa zooplanctónica en la región central (líneas 113-137). Los datos de 1951-1981 son de los cruceros CalCOFI. Las anomalías se calcularon restando la media estacional del periodo 1951-1981. Datos transformados a logaritmos.

Figure 6. Zooplankton biomass variability in the central region (lines 113-137). Data for 1951-1981 are from CalCOFI cruises. Anomalies were calculated removing the seasonal mean for the period 1951-1981. Data transformed to logarithms.

El contraste fue aún mayor para el verano. La mediana de julio de 2004 fue record de verano dentro del periodo 1997-2004. El 100% de las muestras del crucero 0407 presentaron una abundancia total por encima de los 20 ind m<sup>-3</sup> y 36% superaron los 100 ind m<sup>-3</sup> (Tabla 8).

La comunidad del zooplancton durante 2004 estuvo dominada por copépodos, con una abundancia mayor en abril (59%) y en los meses restantes se mantuvo en 46-47% (Fig. 7; Tablas 6-9). Los eufáusidos fueron el segundo grupo más abundante en primavera y verano (13% en ambos), pero en invierno y otoño fueron sobrepasados por los quetognatos. La combinación de copépodos, eufáusidos y quetognatos durante 2004 promedió entre 65 y 79% de la abundancia total.

The contrast was even higher for the summer. The median of July 2004 was record for this season in the period 1997-2004. The 100% of the samples from the 0407 cruise presented a total abundance above of 20 ind m<sup>-3</sup> and 36% surpassed 100 ind m<sup>-3</sup> (Tabla 8).

The zooplankton community during 2004 was dominated by copepods, with the highest abundance in April (59%), remaining in 46-47% the rest of the year (Fig. 7; Tables 6-9). The euphausiids were the second group in abundance during spring and summer (13% in both), but in winter and fall were surpassed by the chaetognaths. The combination of copepods, euphausiids, and chaetognaths during 2004 averaged between 65 and 79% of the total abundance.

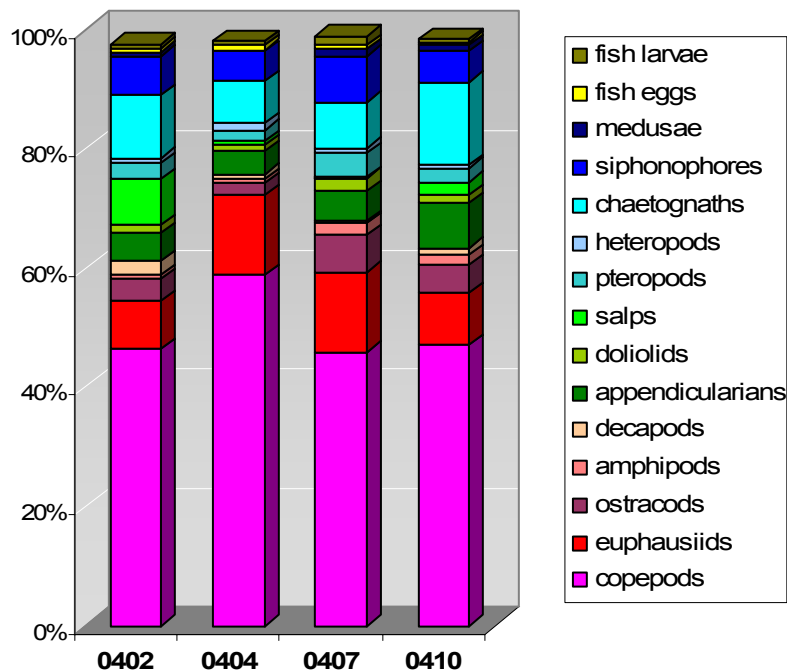


Figura 7. Abundancia relativa de los principales taxa durante los cruceros IMECOCAL de 2004.

Figure 7. Relative abundance of the main taxa in the IMECOCAL cruises of 2004.

En el conjunto de los tunicados, las appendicularias fueron muy abundantes todo el año. El máximo porcentaje que se haya observado de estos organismos fue en octubre 2004 (7.5%). En febrero se encontró un alto

In the assemblage of tunicates, the appendicularinas were very abundant year round. The maximal percentage of these organisms was observed in October 2004 (7.5%). In February a high percentage of

porcentaje de salpas (7.6%) pero disminuyeron fuertemente en primavera y verano. Los doliolidos mostraron menos contrastes manteniéndose entre 1.0 y 2.2% de la abundancia total de zooplankton durante el año. Escasos pirosonas fueron encontrados únicamente en febrero.

Los sifonóforos, pterópodos y ostrácodos presentaron una regular abundancia, sumando entre 9 y 18% durante los cruceros de 2004. En Julio se registró la mayor proporción de ostrácodos de los cruceros IMECOCAL (6.3%).

#### **4.1 Patrones de distribución durante 2004**

A continuación se describe la distribución de los grupos taxonómicos con mayor abundancia en la comunidad del zooplankton:

**Copépodos.** En la zona oceánica la abundancia de copépodos osciló entre 2 y 119 ind  $m^{-3}$  durante 2004 (Fig. 8). En la plataforma continental, aunque la abundancia fue generalmente mayor, mostró una fuerte variación estacional. Las máximas capturas ( $>1500$  ind  $m^{-3}$ ) fueron observadas en verano en el Golfo de Ulloa. La tendencia estacional fue similar a la de 2003, pero los parches cerca de la costa fueron muy densos en 2004.

**Eufáusidos.** La abundancia varió entre regiones y también mostró un fuerte gradiente costa-oceano (Fig. 9). Una mayor cantidad de eufáusidos fue observada en la región central durante febrero, con máximos localizados en Bahía Vizcaino y Pta. San Hipólito (27°N). En contraste, durante julio la región norte presentó mayor abundancia que varias estaciones de la región central hacia mar afuera, pero en general se mantuvieron por debajo de los 30 ind  $m^{-3}$ . En las estaciones cercanas a la costa se obtuvieron capturas de hasta 586 ind  $m^{-3}$  (Golfo de Ulloa).

salps was found (7.6%) but showed a strong decrease in spring and summer. Doliolids presented less contrasts maintaining between 1.0 and 2.2% of the total zooplankton abundance year round. Scarce pyrosomes were found only in February.

The siphonophores, pteropods, and ostracods presented regular abundance, summing between 9 and 18% during the cruises of 2004. In 0407 the highest proportion of ostracods was found in the IMECOCAL cruises (6.3%).

#### **4.1 Distributional patterns during 2004**

This section describes distribution of the taxonomic groups with highest abundance in the zooplankton community:

**Copepods.** In the oceanic zone, copepods abundance oscillated between 2 and 119 ind  $m^{-3}$  during 2004 (Fig. 8). In the continental shelf, though the abundance was generally higher, showed a strong seasonal variability. The maximal captures ( $>1500$  ind  $m^{-3}$ ) were observed in summer at the Gulf of Ulloa. The seasonal tendency was similar to that of 2003, but the patches near the coast had high density in 2004.

**Euphausiids.** The abundance varied between regions and also showed a strong coastal-ocean gradient (Fig. 9). A higher amount of euphausiids was observed in the central region during February, with maximums located in Vizcaino Bay and Pt. San Hipolito (27°N). In contrast, during July the north region presented higher abundance than several stations of the central offshore region, but in general remained below 30 ind  $m^{-3}$ . Near the coast, captures up to 586 ind  $m^{-3}$  occurred at some stations (Gulf of Ulloa).

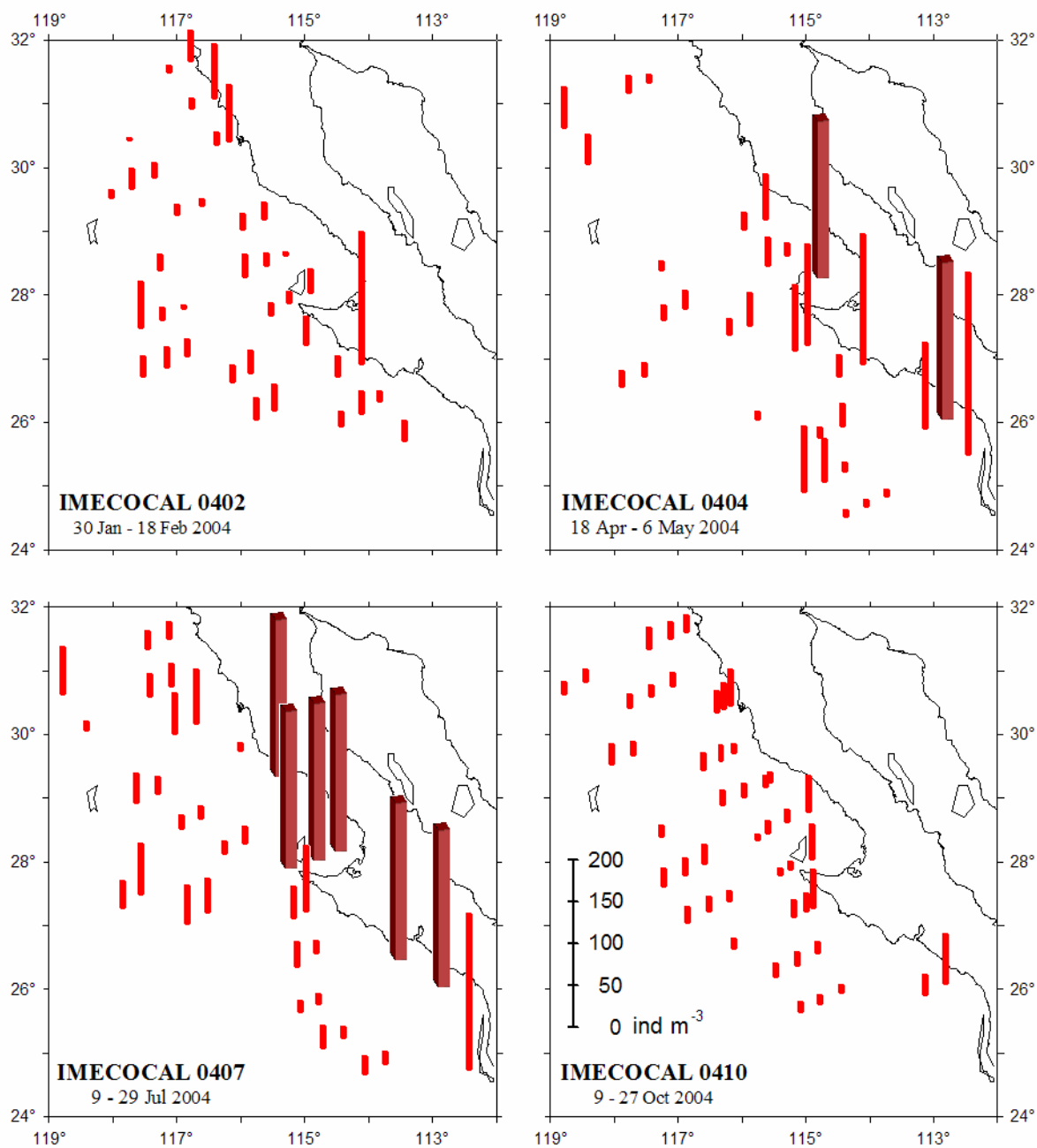


Figura 8. Distribución de copépodos durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado.

Figure 8. Distribution of copepods during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank.

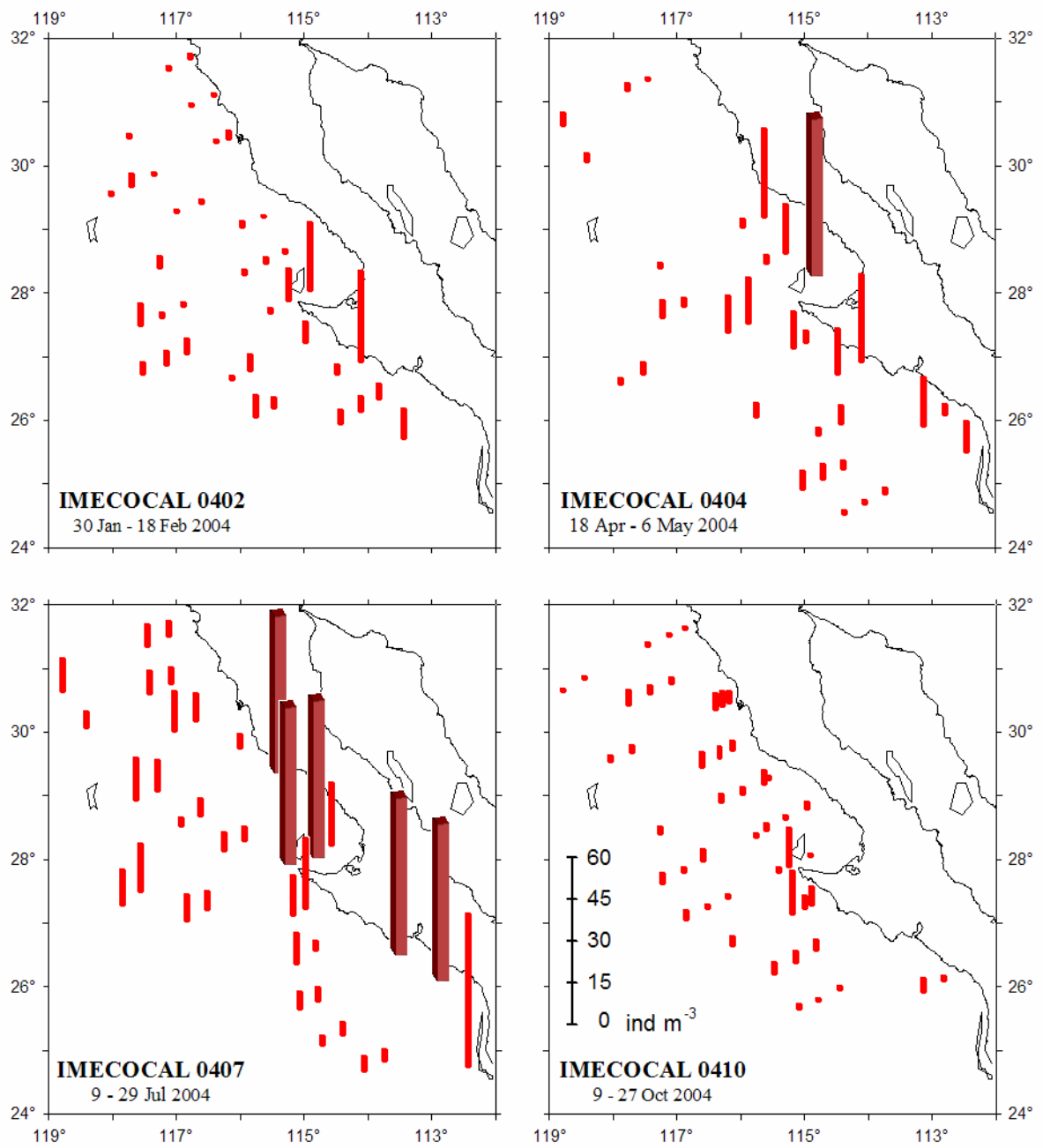


Figura 9. Distribución de eufáusidos durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado.

Figure 9. Distribution of euphausiids during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank.

**Ostrácodos.** Este grupo de organismos mostró una tendencia claramente oceánica (Fig. 10). Su abundancia aumentó fuertemente en verano. En otoño volvió a descender la abundancia, mayormente en la parte sur del área.

**Anfípodos.** Al igual que en 2003, los anfípodos fueron muy escasos en invierno y primavera de 2004 (Fig. 11). En verano se incrementaron, especialmente en la región norte. Su distribución contrastó con la de salpas (Fig. 14) y fue más coincidente con la de otros organismos gelatinosos, como sifonóforos (Fig. 17) y medusas (Fig. 18), a los que suelen estar asociados. En octubre disminuyó su abundancia, exceptuando dos estaciones del Golfo de Ulloa.

**Apendicularias.** Este grupo presentó variaciones estacionales que contrastan a lo observado en 2003. Las apendicularias no solo estuvieron bien representadas a lo largo del año 2004, sino que además no se observó un gradiente costa-oceano, mas que en la parte sur del área (Fig. 12).

**Doliólidos.** Con una distribución oceánica, los doliólidos mostraron mayores abundancias en la región central durante febrero (Fig. 13). Disminuyeron en abril, cuando el flujo principal de la Corriente de California fue muy intenso (Goericke *et al.*, 2005), por lo que parecen asociados con el agua del Pacífico central. En julio la Corriente de California se debilitó, mostrando el desarrollo de meandros, los cuales tuvieron asociados abundantes doliólidos. En octubre disminuyeron, aunque la est. 133.25 presentó un enjambre de 55 ind m<sup>-3</sup>.

**Salpas.** Se encontraron abundantes salpas en Bahía Vizcaíno y sus alrededores durante febrero (Fig. 14). En contraste, fueron muy escasas durante abril y julio, estando ausentes en un gran número de muestras. En octubre se incrementaron nuevamente con un patrón similar al observado en invierno, pero con enjambres menos densos. En la figura no se incluyen las salpas de mayor tamaño (ver Tabla 5).

**Ostracods.** This group of organisms showed a clearly oceanic tendency (Fig. 10). Their abundance strongly increases in summer. In fall decreased again, mainly at the southern part of the area.

**Amphipods.** As occurred in 2003, amphipods were scarce during winter and spring of 2004 (Fig. 11). They increased during summer, particularly in the north region. The distribution of amphipods contrasted with that of salps (Fig. 14), but coincided with the distribution of other gelatinous organisms as siphonophores (Fig. 17) and medusae (Fig. 18) to which are associated. In October their abundance decreased, excepting two stations in the Gulf of Ulloa.

**Appendicularians.** This group presented different seasonal variations to the year 2003. The appendicularians were not only present along the year 2004, but the coastal-ocean gradient, characteristic in the previous year, was restricted to the southern lines in 2004 (Fig. 12).

**Doliolids.** With an oceanic distribution, the doliolids showed higher abundances in the central region during February (Fig. 13). Decreased in April, when the main flow of the California Current was strong (Goericke *et al.*, 2005), in view of that appeared to be associated with the central Pacific water. In July, the California Current weakened, developing meanders to which abundant doliolids were associated. They decreased in October, though the st. 133.25 presented one swarm of 55 ind m<sup>-3</sup>.

**Salps.** Abundant salps were found in Vizcaino Bay and adjacent waters during February (Fig. 14). In contrast, they were scarce during April and July, being absent in many samples. In October increased again with a similar pattern to that observed in winter, but with swarms less dense. The largest salps are not included in the figure (see Table 5).

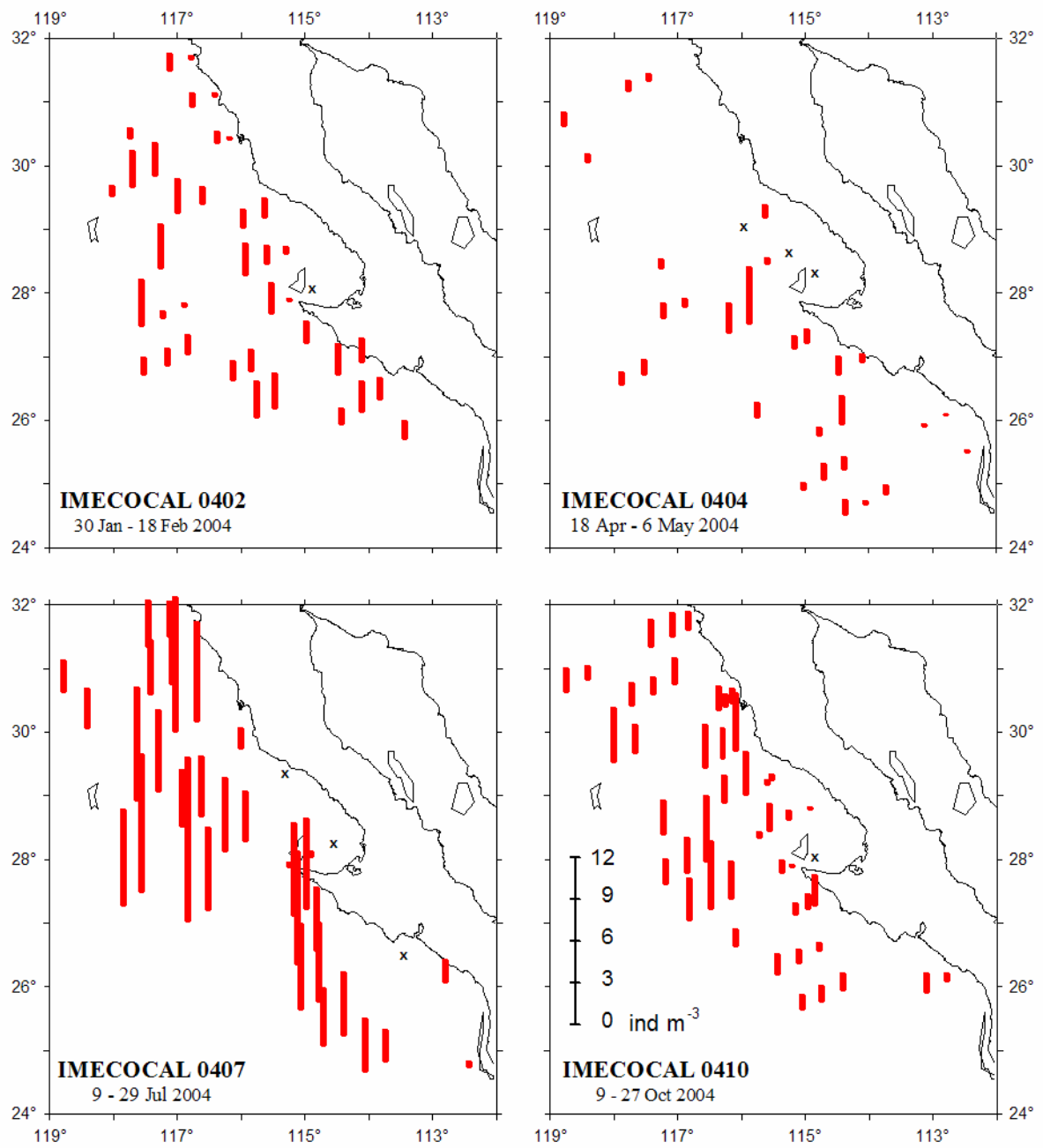


Figura 10. Distribución de ostrácodos durante 2004 en estaciones nocturnas. Las cruces indican ausencia.

Figure 10. Distribution of ostracods during 2004 in nighttime stations. Crosses indicate absence.



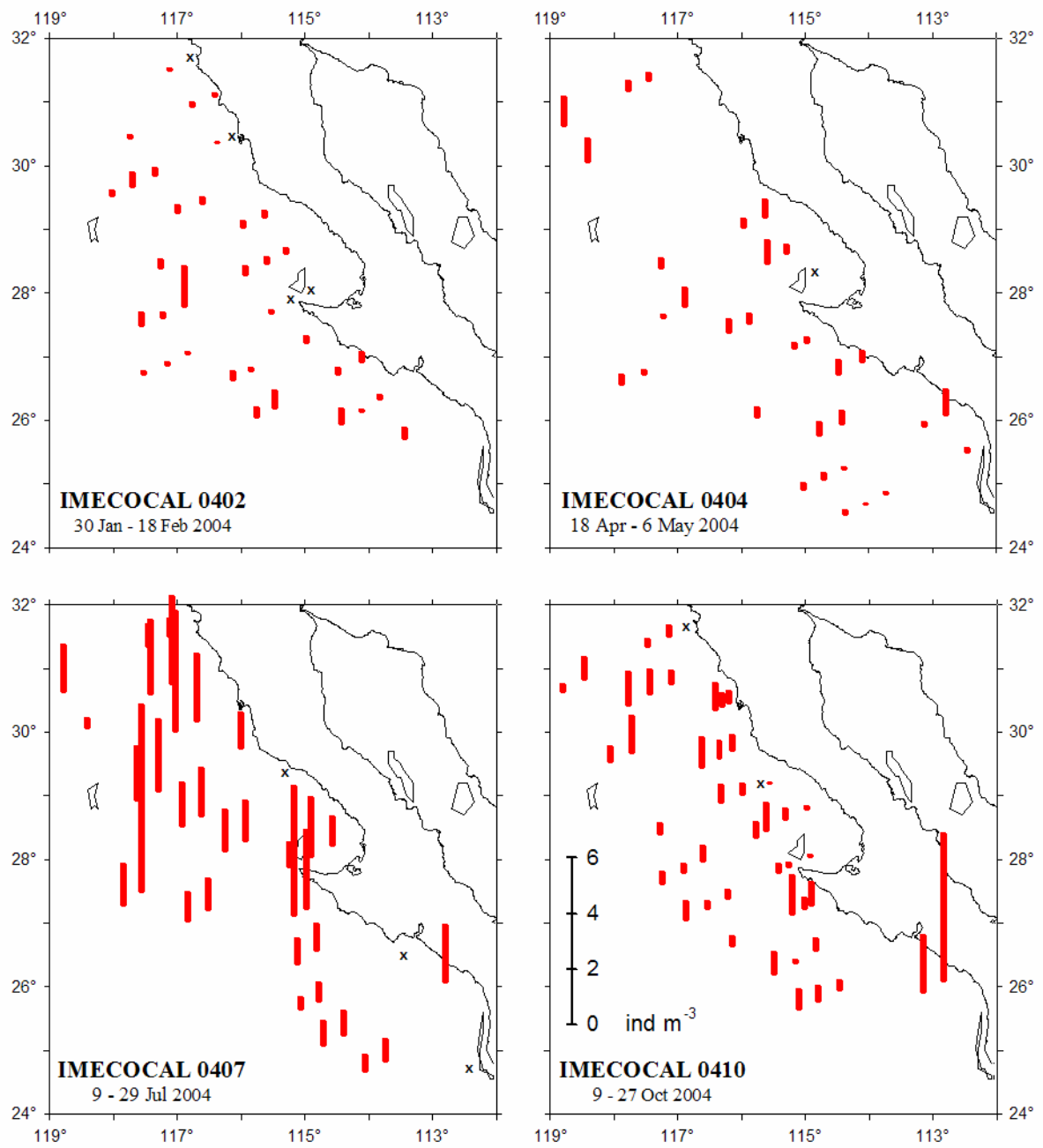


Figura 11. Distribución de anfípodos durante 2004 en estaciones nocturnas. Las cruces indican ausencia.

Figure 11. Distribution of amphipods during 2004 in nighttime stations. Crosses indicate absence.

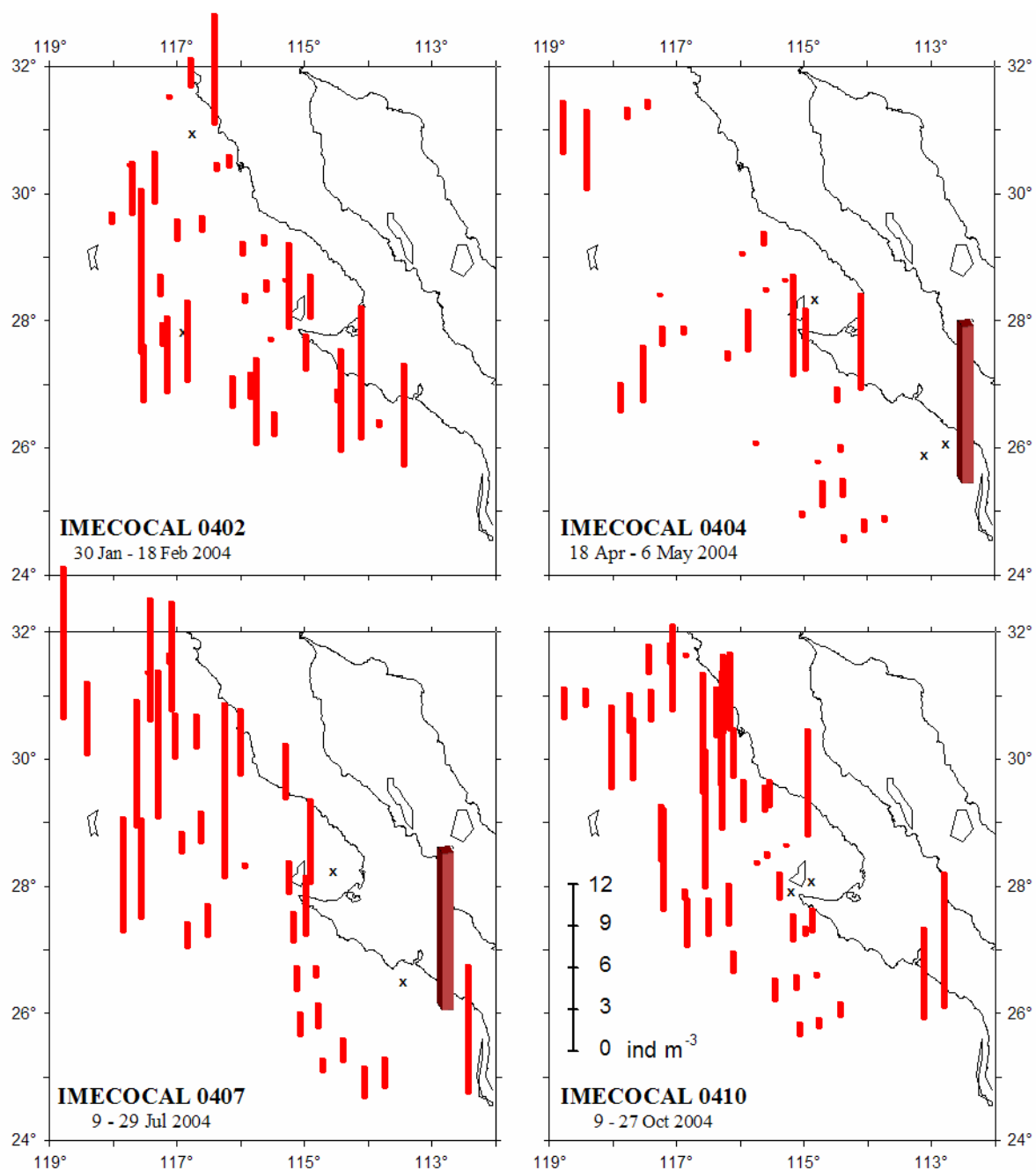


Figura 12. Distribución de apendicularias durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 12. Distribution of appendicularians during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

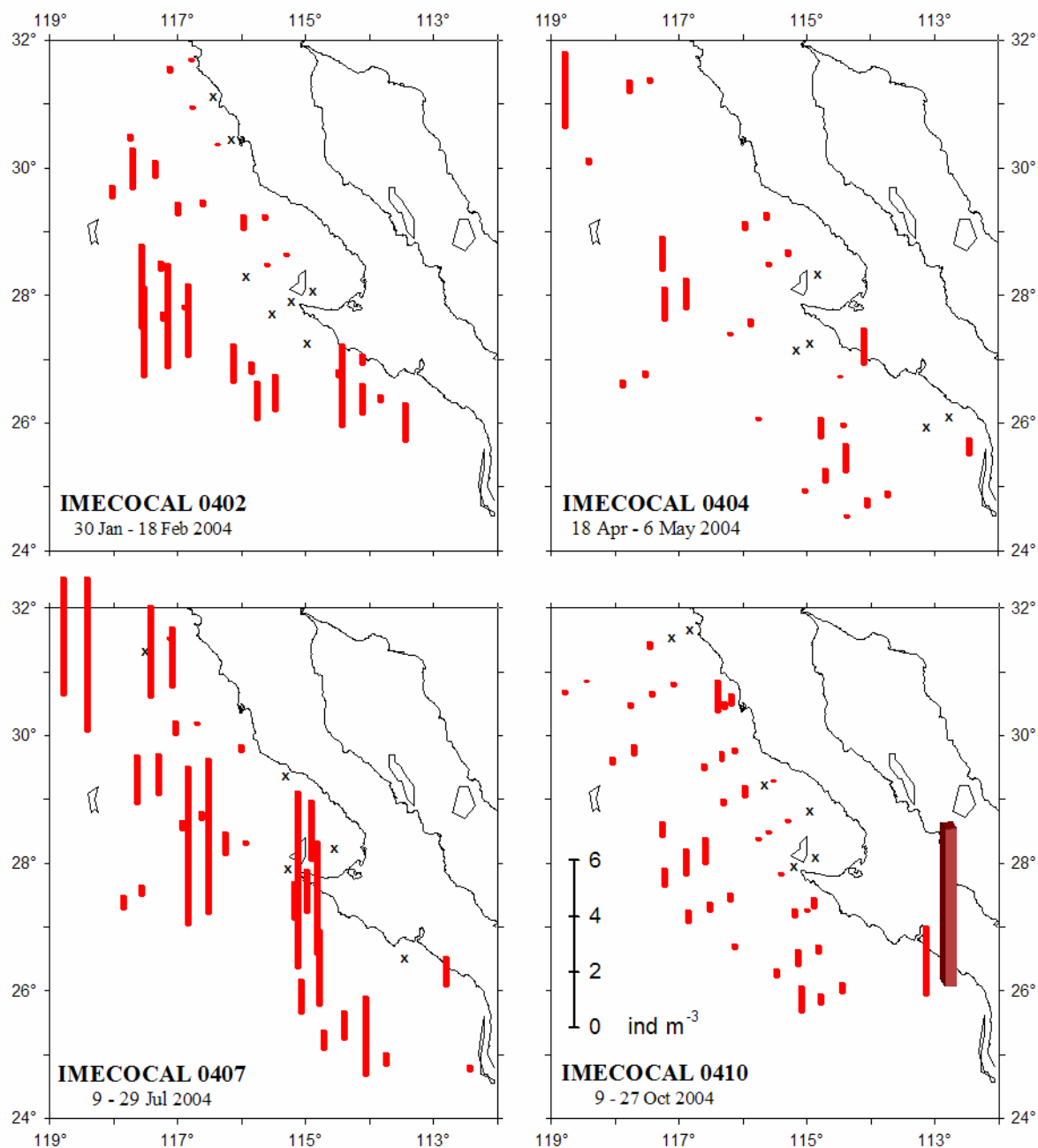


Figura 13. Distribución de doliólidos durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 13. Distribution of doliolids during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

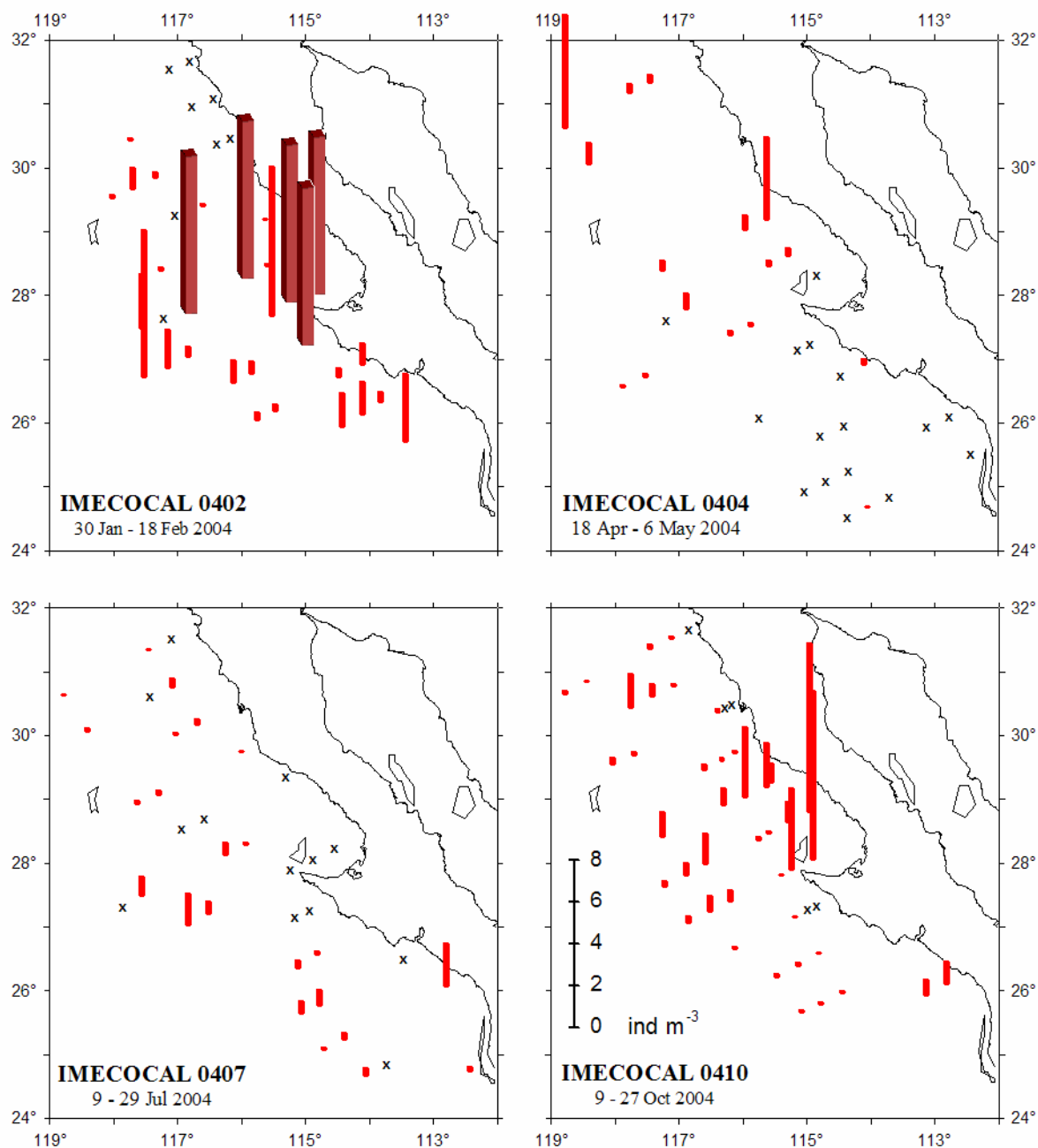


Figura 14. Distribución de salpas durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 14. Distribution of salps during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

**Pterópodos.** Al igual que otros grupos herbívoros, la máxima abundancia ocurrió en Julio (Fig. 15). El resto del año estuvieron ampliamente distribuidos pero con baja abundancia. Se observaron diferencias regionales, siendo la región norte más rica en pterópodos durante la primavera, y la región central en invierno y otoño. Se encontraron restos del género *Corolla* (de gran tamaño) principalmente en febrero y en menor cantidad en abril (Tabla 5).

**Quetognatos.** Este taxón fue más abundante en la región central durante febrero (Fig. 16). Posteriormente disminuyó, observándose una baja abundancia en toda el área durante primavera. Volvieron a incrementarse en verano en la zona oceánica, mostrando un avance hacia la zona costera en octubre.

**Sifonóforos.** Presentaron un patrón de distribución más o menos similar al de los quetognatos durante invierno y verano (Fig. 17). Su distribución fue diferente a la de este grupo de depredadores en primavera y otoño, ya que los sifonóforos exhibieron una tendencia a mayores abundancias en la región norte.

**Medusas.** También coincidió su patrón de distribución al de los quetognatos en invierno y verano (Fig. 18). En primavera disminuyeron fuertemente, pero aumentaron rápidamente en el verano, sobre todo en el Golfo de Ulloa. En octubre presentaron abundancias inferiores a  $2 \text{ ind m}^{-3}$  en la mayor parte del área y solo frente a San Quintín y Pta. Baja se observó una mayor densidad poblacional de estos depredadores.

**Ictioplancton.** En el verano se encontró la mayor cantidad de huevos y larvas de peces, con un sesgo hacia la zona oceánica (Fig. 19). Esto contrasta con la disminución que siguió en octubre mar afuera, mientras que sobresalieron valores altos en Bahía Vizcaíno y Golfo de Ulloa.

**Pteropods.** As other herbivore groups, the maximal abundance occurred in July (Fig. 15). The rest of the year were widely distributed but in low abundance. Regional differences were observed, being the north region richer in pteropods during spring, and the central region in winter and fall. Remnants of the genus *Corolla* (of large size) were found mainly in February and in fewer amounts during April (Table 5).

**Chaetognaths.** This taxon was more abundant in the central region during February (Fig. 16). Further decreased, showing low abundance in the whole area during spring. They increased again in summer in the oceanic zone, moving forward the coastal zone in October.

**Siphonophores.** Presented a distribution pattern more or less similar to that of chaetognaths during winter and summer (Fig. 17). Their distribution differed from this group of predators in spring and fall, because the siphonophores displayed a tendency to higher abundance in the north region.

**Medusae.** Their distribution pattern was also coincident to that of the chaetognaths during winter and summer (Fig. 18). In spring strongly decreased, but rapidly rebounded in summer, particularly in the Gulf of Ulloa. In October, most of the area presented abundances lower than  $2 \text{ ind m}^{-3}$ , and only off San Quintín and Pta. Baja was observed a higher population density of these predators.

**Ichthyoplankton.** The highest amount of fish eggs and larvae was found in the summer, with a preference toward the oceanic zone (Fig. 19). This is contrasting with the further diminution offshore during October, while high values stood out in Vizcaino Bay and Gulf of Ulloa.

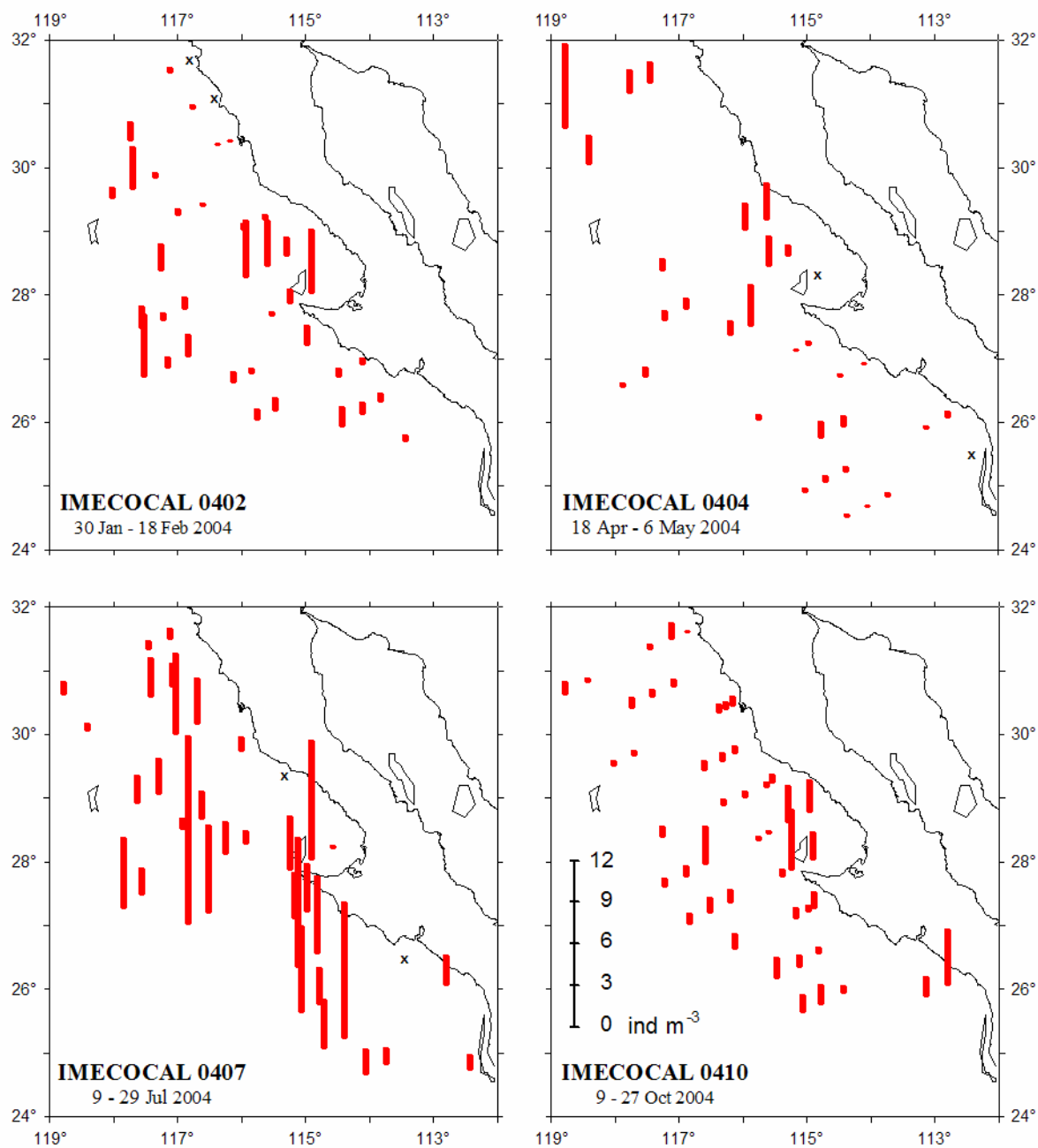


Figura 15. Distribución de pterópodos durante 2004 en estaciones nocturnas. Las cruces indican ausencia.  
Figure 15. Distribution of pteropods during 2004 in nighttime stations. Crosses indicate absence.

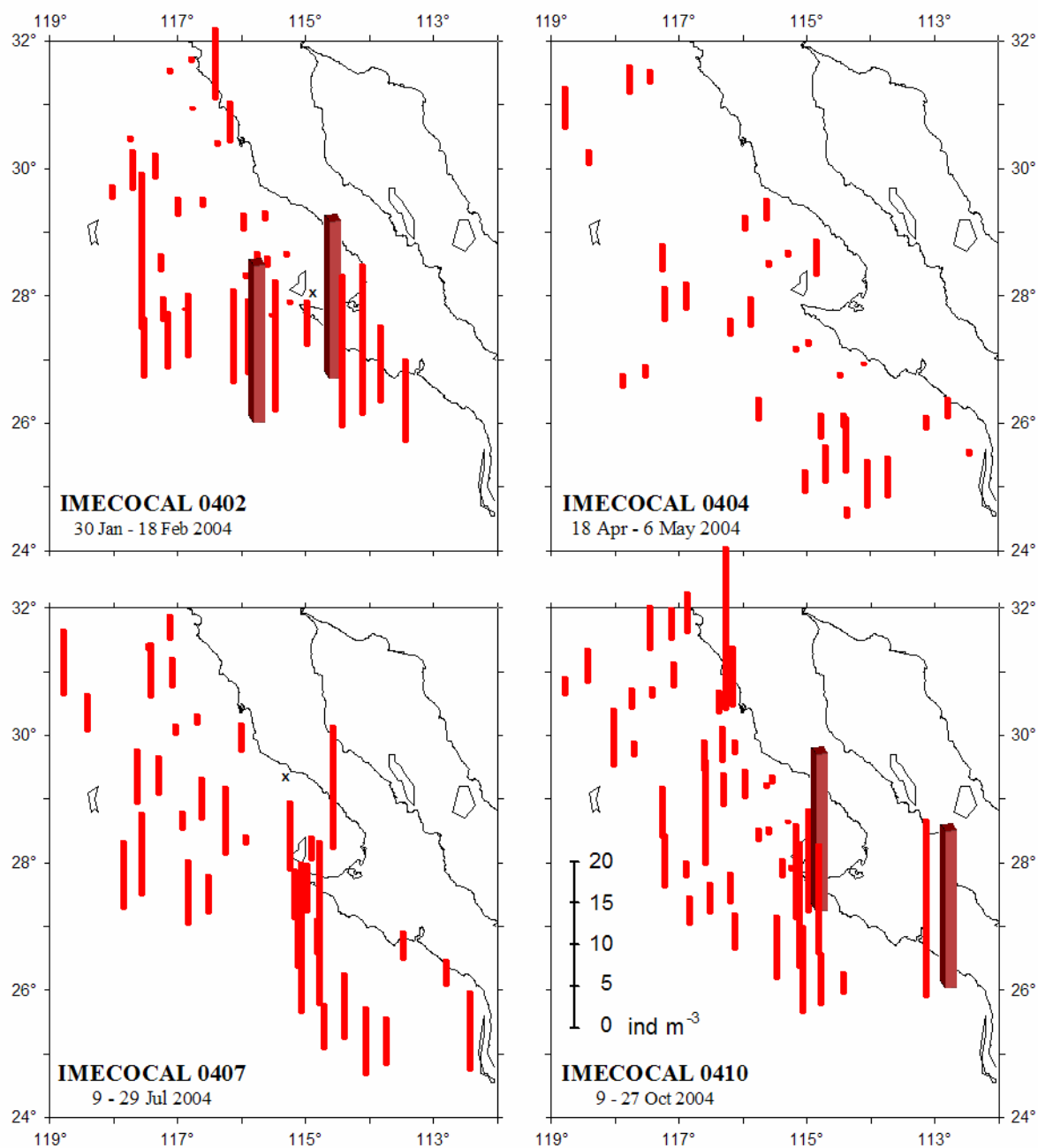


Figura 16. Distribución de quetognatos durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 16. Distribution of chaetognaths during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

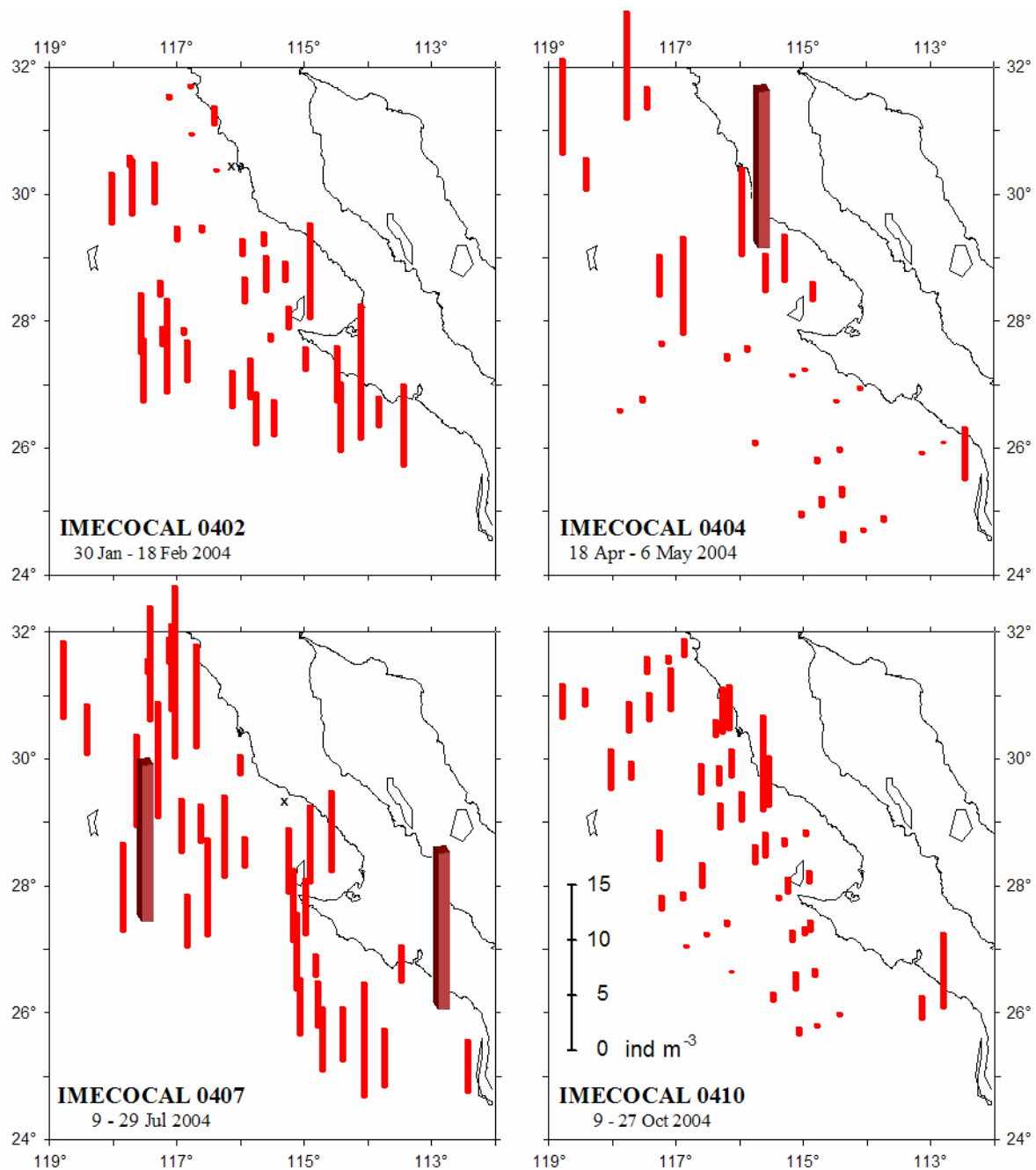


Figura 17. Distribución de sifonóforos durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 17. Distribution of siphonophores during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.



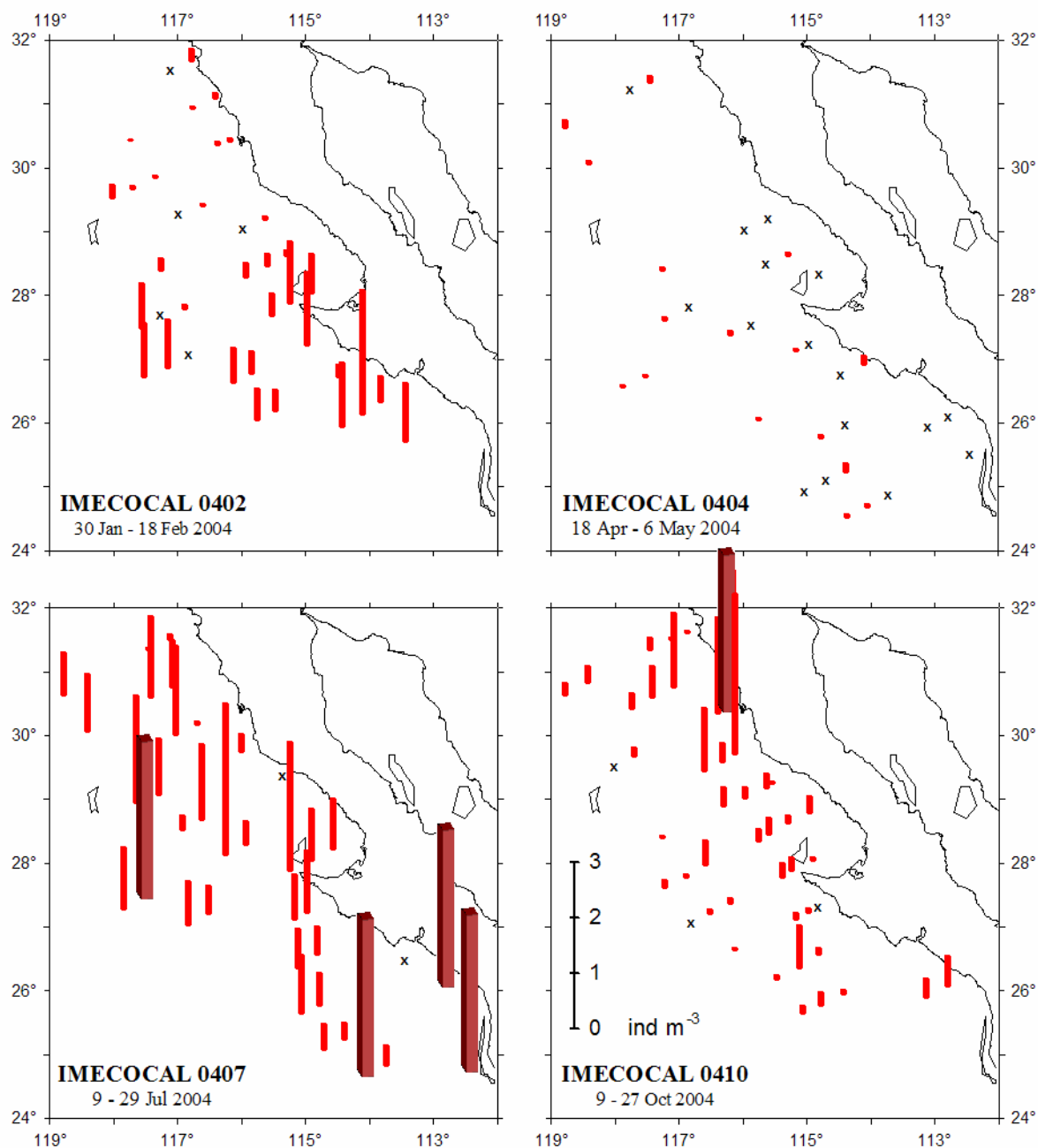


Figura 18. Distribución de medusas durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 18. Distribution of medusae during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

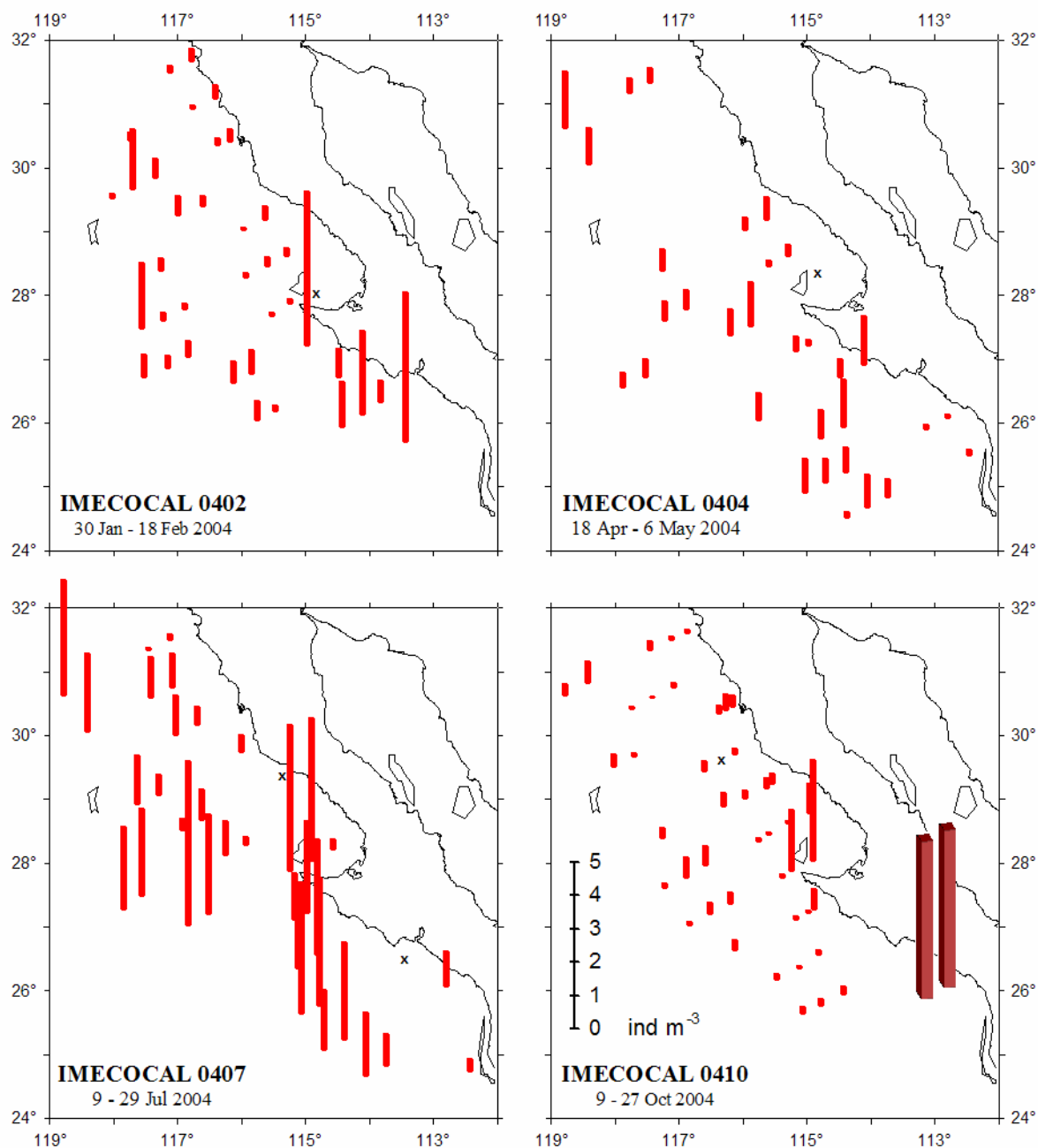


Figura 19. Distribución de huevos y larvas de peces durante 2004 en estaciones nocturnas. Las barras cafés representan capturas superiores al intervalo especificado y las cruces indican ausencia.

Figure 19. Distribution of fish eggs and larvae during 2004 in nighttime stations. Brown bars represent captures higher to the stipulated rank, and crosses indicate absence.

Los taxa descritos representaron entre el 95 y el 98% de la abundancia total. Otros grupos menos abundantes también mostraron tendencias estacionales. Por ejemplo, las larvas de estomatópodos ocurrieron preferentemente en febrero, aunque su abundancia fue menor que la observada en febrero de 2003. Los decápodos predominaron en invierno y primavera. Dentro de este conjunto, la langostilla (*Pleuroncodes planipes*), presentó baja abundancia en febrero pero aumentó en abril y ocurrió hacia el extremo sur del área (líneas 130-137). Sin embargo, la máxima captura (0.9 ind m<sup>-3</sup>) fue en la est. 113.30 durante Julio.

En cuanto a las larvas filosoma de la langosta espinosa (*Panulirus interruptus*), su cobertura en la región central fue menor en 2004 (5-14% muestras por crucero) a la observada en 2003 (19-31% muestras por crucero).

Los juveniles de cefalópodos también se colectaron en menor proporción durante los cruceros de 2004: 7-25% de las muestras de la región norte y 14-20% de la central.

#### **4.2 Composición del zooplancton de 1997 a 2004 (serie IMECOCAL)**

Hemos comentado anteriormente que algunos de los taxa principales aumentaron en 2004, así como otros grupos misceláneos disminuyeron respecto al año 2003. Se aprecia que en el contexto del periodo 1997-2004, existió una similitud entre 2002 y 2004 por las altas densidades de copépodos en la región central (Fig. 20). No obstante hubo una diferencia entre ambos años en el acontecimiento de la productividad máxima, ya que en 2002 el pico de copépodos tuvo lugar en primavera, mientras que en 2004 ocurrió en verano. En medio de esos dos años, 2003 parece ser un año anómalamente pobre por el efecto del Niño 2002-2003, el cual se manifestó más claramente en la región central.

The taxa described represented between 95 and 98% of the total abundance. Other less abundant groups also showed seasonal tendencies. Per example, the stomatopod larvae occurred mainly in February, though their abundance in 2004 was lower to that observed in February 2003. Decapods dominated in winter and spring. In this assemblage, the red crab (*Pleuroncodes planipes*), presented low abundance in February but increased in April, and occurred toward the southern edge of the area (lines 130-137). However, the highest capture (0.9 ind m<sup>-3</sup>) was in st. 113.30 during July.

In relation to the phyllosoma larvae of the spiny lobster (*Panulirus interruptus*), their coverage in the central region was lower in 2004 (5-14% samples per cruise) compared to 2003 (19-31% samples per cruise).

The cephalopod juveniles also were collected in lower proportion during the 2004 cruises: 7-25% of the samples in the north region, and 14-20% in the central.

#### **4.2 Zooplankton structure from 1997 to 2004 (IMECOCAL series)**

We have commented above how some of the main taxa increased in 2004, as well as other miscellaneous groups decreased in relation to the year 2003. May be noted in the context of the period 1997-2004, that 2002 and 2004 were similar years in the high copepod density at the central region (Fig. 20). However, there was a difference between both years in the occurrence of the maximal productivity, because in 2002 the copepods peaked in spring, while in 2004 occurred in summer. In the middle of these two years, 2003 appears to be an anomalously poor year due to the effect of the 2002-2003 El Niño, which was affecting more clearly the central region.

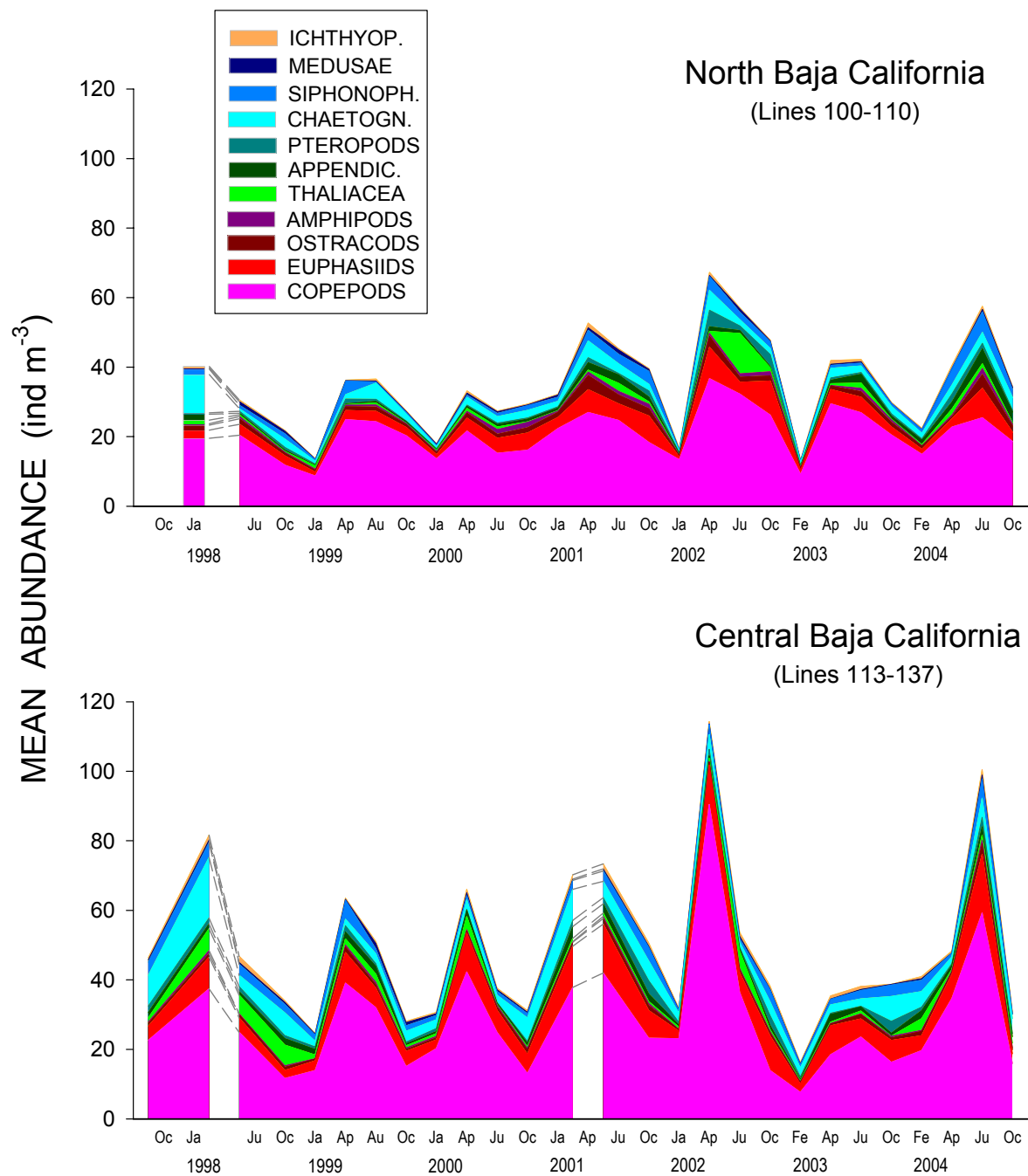


Figura 20. Aportación de los principales taxa por región en los cruceros IMECOCAL. Las superficies apiladas se basan en las medias geométricas por taxon.

Figure 20. Proportion of the main taxa by region in the IMECOCAL cruises. The stacked surfaces are based in geometric means per taxon.

Cuando se comparan las medias geométricas de la abundancia total de zooplancton durante 2004, la región norte (líneas 100-110) resultó proporcionalmente menor que la región central (líneas 113-137) de invierno a verano. Así, en febrero y julio la región central contuvo el doble de organismos, en abril tuvo 40% más, y solo en octubre la abundancia total fue equivalente entre las regiones.

Además de los copépodos, destacaron los eufáusidos entre los taxa con mayor proporción en la región central durante 2004. En dicha región su media geométrica de julio alcanzó los 17 ind m<sup>-3</sup>, constituyendo el doble de eufáusidos que los registrados en la región norte.

En contraste, las apendicularias fueron más importantes en la región norte, en la medida que de abril a octubre hubo 66-69% más respecto a la región central. Los sifonóforos también presentaron un superávit en la región norte durante abril y octubre (335 y 92% respectivamente).

Otros grupos de tunicados, como las salpas, presentaron algunas particularidades en 2004, como fue su gran abundancia en la región central durante febrero (2 ind m<sup>-3</sup>). El único invierno del periodo 1998-2004 que sobrepasó la media geométrica del crucero 0402 fue 9801 (5 ind m<sup>-3</sup>). Aunque en este último la razón entre las regiones central y norte fue 7:1 veces, mientras que en el crucero 0402 fue 22:1. La proporción regional se invirtió en el siguiente crucero (0404), cuando las salpas de la región central representaron solo el 14% de la abundancia observada en la región norte (1 ind m<sup>-3</sup>). Esta ha sido la máxima primaveral del periodo 1998-2004 en la región norte.

## 5. AGRADECIMIENTOS

Colaboraron en el muestreo de zooplancton: Tomás Campos Alfaro, Patricia Jiménez Rosenberg, Luis Armando Ortiz Valadez, Antonio Low Pfeng, José Luís González Bucio y Jaime

When geometric means of the total zooplankton abundance are compared during 2004, the north region (lines 100-110) resulted proportionally lower than the central region (lines 113-137) from winter to summer. Thus, in February and July the central region contained twice organisms, in April had 40% more, and only in October the total abundance was equivalent between regions.

Besides of the copepods, euphausiids stood out among the taxa with high proportion in the central region during 2004. In that region their geometric mean from July reached 17 ind m<sup>-3</sup>. This was twofold of the euphausiids recorded in the north region.

In contrast, the appendicularians were more important in the north region, being from April to October 66-69% more in relation to the central region. The siphonophores also had surplus in the north region during April and October (335 and 92% respectively).

Other tunicate groups, as salps, presented some particularities in 2004, as was their high abundance in the central region during February (2 ind m<sup>-3</sup>). The only winter from the period 1998-2004 surpassing the geometric mean of the cruise 0402 was 9801 (5 ind m<sup>-3</sup>). Though in this last the ratio between central and north regions was 7:1, while in the cruise 0402 was 22:1. The regional proportion reversed in the next cruise (0404), when the salps from the central region represented only 14% of the abundance observed in the north region (1 ind m<sup>-3</sup>). This has been the spring maximum in the period 1998-2004 at northern region.

## 5. ACKNOWLEDGEMENTS

Collaborators in the zooplankton sampling were: Tomás Campos Alfaro, Patricia Jiménez Rosenberg, Luis Armando Ortiz Valadez, Antonio Low Pfeng, José Luís González Bucio, and

Morales Sánchez. Se reconoce ampliamente el esfuerzo de la tripulación del B/O *Francisco de Ulloa*. Los datos CalCOFI de biomasa de zooplancton fueron amablemente proporcionados por Paul Smith. El apoyo financiero provino del proyecto CONACYT 42569.

Jaime Morales Sánchez. The effort of the R/V *Francisco de Ulloa* crew is greatly appreciated. Paul Smith kindly provided the CalCOFI data of zooplankton biomass. The financial support was from CONACYT (Grant 42569).

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**7. APÉNDICE I.– DATOS DE LOS ARRASTRES Y BIOMASA DEL ZOOPLANKTON**  
**APPENDIX I. – DATA OF TOWS AND ZOOPLANKTON BIOMASS**

**Tabla 1. IMECOCAL 0402**

| ESTACION | LATITUD  | LONGITUD  | FECHA<br>(d/m/a) | HORA<br>INICIAL  | HORA<br>FINAL  | VOLUM.<br>FILTR.   | PROF.<br>MAXIMA  | BIOMASA<br>CHICA      | BIOMASA<br>TOTAL      |
|----------|----------|-----------|------------------|------------------|----------------|--------------------|------------------|-----------------------|-----------------------|
| STATION  | LATITUDE | LONGITUDE | DATE<br>(d/m/y)  | STARTING<br>HOUR | ENDING<br>HOUR | FILTERED<br>VOLUME | MAXIMAL<br>DEPTH | SMALL<br>BIOMASS      | TOTAL<br>BIOMASS      |
|          | (N)      | (W)       |                  | (h:m)            | (h:m)          | (m <sup>3</sup> )  | (m)              | (µl m <sup>-3</sup> ) | (µl m <sup>-3</sup> ) |
| 100.30   | 31° 39.5 | 116° 45.7 | 30/01/2004       | 23:42            | 00:00          | 635                | 212              | 107                   | 107                   |
| 100.35   | 31° 30.4 | 117° 05.9 | 31/01/2004       | 04:42            | 04:59          | 395                | 212              | 81                    | 81                    |
| 103.30   | 31° 07.0 | 116° 24.4 | 02/02/2004       | 21:42            | 21:45          | 110                | 36               | 109                   | 109                   |
| 103.35   | 30° 56.6 | 116° 44.1 | 03/02/2004       | 02:01            | 02:22          | 713                | 212              | 35                    | 77                    |
| 103.40   | 30° 46.2 | 117° 03.7 | 03/02/2004       | 07:39            | 07:57          | 658                | 213              | 14                    | 14                    |
| 103.45   | 30° 36.1 | 117° 23.7 | 03/02/2004       | 12:24            | 12:42          | 583                | 212              | 15                    | 15                    |
| 103.50   | 30° 26.3 | 117° 44.0 | 03/02/2004       | 17:56            | 18:12          | 452                | 213              | 33                    | 33                    |
| 107.32   | 30° 27.4 | 116° 09.9 | 06/02/2004       | 02:14            | 02:30          | 454                | 174              | 84                    | 84                    |
| 107.35   | 30° 20.8 | 116° 22.2 | 06/02/2004       | 05:49            | 06:04          | 554                | 212              | 20                    | 20                    |
| 107.40   | 30° 11.6 | 116° 42.3 | 06/02/2004       | 10:19            | 10:37          | 568                | 212              | 67                    | 86                    |
| 107.45   | 30° 01.2 | 117° 01.0 | 06/02/2004       | 13:48            | 14:05          | 553                | 211              | 69                    | 94                    |
| 107.50   | 29° 50.6 | 117° 21.3 | 06/02/2004       | 19:56            | 20:14          | 571                | 212              | 42                    | 42                    |
| 107.55   | 29° 40.9 | 117° 41.5 | 07/02/2004       | 00:02            | 00:18          | 502                | 212              | 60                    | 70                    |
| 107.60   | 29° 31.0 | 118° 01.2 | 07/02/2004       | 04:20            | 04:37          | 580                | 212              | 28                    | 28                    |
| 110.35   | 29° 47.1 | 115° 59.7 | 08/02/2004       | 10:01            | 10:20          | 627                | 210              | 32                    | 32                    |
| 110.40   | 29° 37.2 | 116° 19.6 | 08/02/2004       | 06:41            | 06:57          | 468                | 210              | 38                    | 38                    |
| 110.45   | 29° 26.2 | 116° 38.9 | 08/02/2004       | 02:57            | 03:16          | 496                | 211              | 52                    | 52                    |
| 110.50   | 29° 16.4 | 116° 58.4 | 07/02/2004       | 22:39            | 22:57          | 493                | 212              | 47                    | 47                    |
| 110.55   | 29° 06.0 | 117° 18.7 | 07/02/2004       | 17:49            | 18:08          | 523                | 212              | 29                    | 29                    |
| 110.60   | 28° 56.6 | 117° 38.5 | 07/02/2004       | 10:30            | 10:46          | 518                | 215              | 35                    | 50                    |
| 113.30   | 29° 23.0 | 115° 18.3 | 08/02/2004       | 17:42            | 17:47          | 147                | 49               | 102                   | 102                   |
| 113.35   | 29° 12.5 | 115° 37.4 | 08/02/2004       | 21:46            | 22:04          | 559                | 214              | 50                    | 50                    |
| 113.40   | 29° 02.4 | 115° 57.6 | 09/02/2004       | 02:13            | 02:33          | 581                | 211              | 60                    | 60                    |
| 113.45   | 28° 52.8 | 116° 17.5 | 09/02/2004       | 06:11            | 06:26          | 476                | 212              | 107                   | 122                   |
| 113.50   | 28° 43.2 | 116° 36.9 | 09/02/2004       | 10:48            | 11:05          | 551                | 214              | 36                    | 73                    |
| 113.55   | 28° 32.9 | 116° 56.6 | 09/02/2004       | 16:48            | 17:05          | 529                | 212              | 30                    | 51                    |
| 113.60   | 28° 22.5 | 117° 15.7 | 09/02/2004       | 21:51            | 22:07          | 542                | 214              | 61                    | 61                    |
| 117.30   | 28° 47.6 | 114° 55.7 | 12/02/2004       | 09:41            | 09:50          | 229                | 85               | 284                   | 284                   |
| 117.35   | 28° 37.2 | 115° 15.6 | 12/02/2004       | 05:51            | 06:05          | 414                | 177              | 29                    | 29                    |
| 117.40   | 28° 26.8 | 115° 34.9 | 12/02/2004       | 01:48            | 02:07          | 584                | 212              | 62                    | 62                    |
| 117.45   | 28° 16.5 | 115° 55.2 | 11/02/2004       | 21:11            | 21:31          | 694                | 213              | 96                    | 107                   |
| 117.50   | 28° 07.2 | 116° 15.2 | 11/02/2004       | 14:34            | 14:54          | 595                | 209              | 17                    | 49                    |
| 117.55   | 27° 56.6 | 116° 34.8 | 11/02/2004       | 10:13            | 10:29          | 547                | 211              | 238                   | 238                   |
| 117.60   | 27° 46.7 | 116° 53.8 | 11/02/2004       | 05:34            | 05:52          | 452                | 211              | 730                   | 730                   |
| 117.65   | 27° 37.0 | 117° 12.7 | 11/02/2004       | 01:24            | 01:42          | 556                | 211              | 52                    | 52                    |
| 117.70   | 27° 27.0 | 117° 32.2 | 10/02/2004       | 21:07            | 21:24          | 563                | 211              | 103                   | 103                   |
| 117.75   | 27° 17.0 | 117° 51.6 | 10/02/2004       | 16:53            | 17:11          | 496                | 212              | 38                    | 38                    |
| 117.80   | 27° 07.3 | 118° 11.0 | 10/02/2004       | 10:32            | 10:48          | 486                | 212              | 109                   | 109                   |
| 119.33   | 28° 17.8 | 114° 52.3 | 12/02/2004       | 14:41            | 14:50          | 302                | 98               | 480                   | 480                   |
| 120.30   | 28° 12.9 | 114° 34.4 | 12/02/2004       | 17:32            | 17:38          | 220                | 85               | 2284                  | 2284                  |

|        |          |           |            |       |       |     |     |      |      |
|--------|----------|-----------|------------|-------|-------|-----|-----|------|------|
| 120.35 | 28° 03.2 | 114° 54.1 | 12/02/2004 | 20:38 | 20:44 | 187 | 71  | 4196 | 4223 |
| 120.39 | 27° 56.1 | 115° 07.8 | 12/02/2004 | 23:26 | 23:28 | 95  | 21  | 169  | 169  |
| 120.45 | 27° 42.1 | 115° 32.9 | 13/02/2004 | 04:09 | 04:25 | 574 | 212 | 94   | 94   |
| 120.50 | 27° 32.9 | 115° 52.5 | 13/02/2004 | 07:41 | 07:57 | 550 | 211 | 44   | 80   |
| 120.55 | 27° 23.0 | 116° 11.8 | 13/02/2004 | 11:19 | 11:37 | 580 | 215 | 41   | 52   |
| 120.60 | 27° 13.4 | 116° 31.5 | 13/02/2004 | 17:06 | 17:22 | 525 | 212 | 44   | 44   |
| 120.65 | 27° 03.0 | 116° 50.9 | 13/02/2004 | 20:55 | 21:13 | 556 | 213 | 54   | 54   |
| 120.70 | 26° 52.7 | 117° 09.2 | 14/02/2004 | 00:52 | 01:12 | 562 | 211 | 69   | 160  |
| 120.75 | 26° 43.2 | 117° 29.0 | 14/02/2004 | 05:01 | 05:17 | 533 | 213 | 45   | 45   |
| 120.80 | 26° 33.3 | 117° 48.3 | 14/02/2004 | 10:08 | 10:26 | 583 | 211 | 86   | 86   |
| 123.42 | 27° 14.2 | 114° 59.0 | 15/02/2004 | 18:50 | 19:05 | 496 | 213 | 200  | 200  |
| 123.45 | 27° 08.8 | 115° 11.0 | 15/02/2004 | 13:24 | 13:44 | 544 | 213 | 42   | 51   |
| 123.50 | 26° 58.0 | 115° 30.4 | 15/02/2004 | 09:03 | 09:21 | 593 | 211 | 67   | 78   |
| 123.55 | 26° 48.1 | 115° 49.4 | 15/02/2004 | 04:47 | 05:03 | 450 | 212 | 80   | 80   |
| 123.60 | 26° 38.0 | 116° 08.0 | 15/02/2004 | 00:21 | 00:42 | 584 | 211 | 115  | 115  |
| 127.35 | 26° 53.7 | 114° 10.2 | 16/02/2004 | 01:36 | 01:43 | 192 | 78  | 265  | 463  |
| 127.40 | 26° 43.1 | 114° 29.0 | 16/02/2004 | 05:24 | 05:40 | 461 | 213 | 61   | 72   |
| 127.45 | 26° 33.3 | 114° 48.2 | 16/02/2004 | 09:13 | 09:34 | 541 | 214 | 111  | 111  |
| 127.50 | 26° 23.4 | 115° 07.9 | 16/02/2004 | 16:09 | 16:25 | 472 | 213 | 83   | 83   |
| 127.55 | 26° 13.4 | 115° 27.2 | 16/02/2004 | 19:41 | 19:57 | 426 | 212 | 82   | 82   |
| 127.60 | 26° 03.1 | 115° 46.0 | 16/02/2004 | 23:34 | 23:54 | 581 | 213 | 102  | 102  |
| 130.30 | 26° 29.4 | 113° 29.8 | 18/02/2004 | 07:17 | 07:21 | 145 | 64  | 1171 | 1171 |
| 130.35 | 26° 18.8 | 113° 48.6 | 18/02/2004 | 03:51 | 04:09 | 424 | 212 | 94   | 120  |
| 130.40 | 26° 09.0 | 114° 07.6 | 17/02/2004 | 23:58 | 00:18 | 450 | 211 | 98   | 98   |
| 130.45 | 25° 59.3 | 114° 26.8 | 17/02/2004 | 19:58 | 20:18 | 508 | 212 | 165  | 183  |
| 130.50 | 25° 49.2 | 114° 45.9 | 17/02/2004 | 16:27 | 16:42 | 349 | 211 | 204  | 204  |
| 130.55 | 25° 38.9 | 115° 05.1 | 17/02/2004 | 10:29 | 10:49 | 559 | 211 | 100  | 100  |
| 130.60 | 25° 28.3 | 115° 23.9 | 17/02/2004 | 06:47 | 07:03 | 413 | 211 | 48   | 48   |
| 133.25 | 26° 05.1 | 112° 49.2 | 18/02/2004 | 13:39 | 13:46 | 196 | 70  | 189  | 270  |
| 133.30 | 25° 55.3 | 113° 08.0 | 18/02/2004 | 16:52 | 17:04 | 286 | 177 | 280  | 280  |
| 133.35 | 25° 44.3 | 113° 26.6 | 18/02/2004 | 20:58 | 21:16 | 522 | 211 | 211  | 211  |



**APÉNDICE I.....continuación**  
**APPENDIX I.....continuation**

**Tabla 2. IMECOCAL 0404**

| ESTACION | LATITUD  | LONGITUD  | FECHA<br>(d/m/a) | HORA<br>INICIAL  | HORA<br>FINAL  | VOLUM.<br>FILTR.   | PROF.<br>MAXIMA  | BIOMASA<br>CHICA      | BIOMASA<br>TOTAL      |
|----------|----------|-----------|------------------|------------------|----------------|--------------------|------------------|-----------------------|-----------------------|
| STATION  | LATITUDE | LONGITUDE | DATE<br>(d/m/y)  | STARTING<br>HOUR | ENDING<br>HOUR | FILTERED<br>VOLUME | MAXIMAL<br>DEPTH | SMALL<br>BIOMASS      | TOTAL<br>BIOMASS      |
|          | (N)      | (W)       |                  | (h:m)            | (h:m)          | (m <sup>3</sup> )  | (m)              | (µl m <sup>-3</sup> ) | (µl m <sup>-3</sup> ) |
| 100.30   | 31° 40.9 | 116° 46.4 | 18/04/2004       | 12:58            | 13:18          | 677                | 211              | 121                   | 121                   |
| 100.35   | 31° 30.4 | 117° 06.8 | 18/04/2004       | 08:32            | 08:49          | 530                | 213              | 104                   | 104                   |
| 100.40   | 31° 20.8 | 117° 26.8 | 18/04/2004       | 04:21            | 04:38          | 417                | 212              | 43                    | 55                    |
| 100.45   | 31° 10.7 | 117° 46.9 | 17/04/2004       | 23:53            | 00:13          | 585                | 210              | 113                   | 113                   |
| 100.50   | 31° 00.7 | 118° 07.3 | 17/04/2004       | 19:21            | 19:37          | 426                | 211              | 174                   | 174                   |
| 100.55   | 30° 49.8 | 118° 26.3 | 17/04/2004       | 11:23            | 11:39          | 493                | 213              | 34                    | 34                    |
| 100.60   | 30° 39.8 | 118° 47.1 | 17/04/2004       | 00:30            | 00:48          | 505                | 210              | 224                   | 224                   |
| 103.30   | 31° 06.7 | 116° 24.4 | 18/04/2004       | 18:58            | 19:01          | 108                | 49               | 92                    | 92                    |
| 103.55   | 30° 16.4 | 118° 04.5 | 19/04/2004       | 14:46            | 15:05          | 487                | 210              | 74                    | 107                   |
| 103.60   | 30° 05.7 | 118° 23.8 | 19/04/2004       | 20:12            | 20:29          | 487                | 215              | 123                   | 123                   |
| 107.50   | 29° 51.1 | 117° 21.6 | 20/04/2004       | 12:50            | 13:10          | 495                | 210              | 44                    | 44                    |
| 110.35   | 29° 45.5 | 115° 59.3 | 21/04/2004       | 14:23            | 14:42          | 600                | 211              | 225                   | 225                   |
| 113.30   | 29° 22.4 | 115° 18.0 | 24/04/2004       | 07:12            | 07:15          | 111                | 49               | 485                   | 548                   |
| 113.35   | 29° 11.4 | 115° 37.4 | 24/04/2004       | 02:33            | 02:53          | 604                | 211              | 195                   | 195                   |
| 113.40   | 29° 02.5 | 115° 56.7 | 23/04/2004       | 21:26            | 21:45          | 535                | 215              | 142                   | 151                   |
| 113.45   | 28° 51.8 | 116° 17.0 | 23/04/2004       | 16:52            | 17:08          | 475                | 211              | 74                    | 74                    |
| 113.50   | 28° 43.2 | 116° 36.9 | 23/04/2004       | 11:05            | 11:23          | 536                | 214              | 140                   | 140                   |
| 113.55   | 28° 32.5 | 116° 56.5 | 23/04/2004       | 06:25            | 06:41          | 451                | 213              | 36                    | 36                    |
| 113.60   | 28° 22.6 | 117° 16.0 | 22/04/2004       | 21:28            | 21:45          | 452                | 219              | 71                    | 71                    |
| 117.30   | 28° 47.5 | 114° 55.5 | 24/04/2004       | 16:37            | 16:45          | 188                | 99               | 827                   | 827                   |
| 117.35   | 28° 37.0 | 115° 14.8 | 24/04/2004       | 20:34            | 20:49          | 483                | 186              | 108                   | 108                   |
| 117.40   | 28° 27.2 | 115° 34.7 | 25/04/2004       | 03:50            | 04:07          | 468                | 213              | 158                   | 158                   |
| 117.45   | 28° 17.4 | 115° 54.5 | 25/04/2004       | 08:17            | 08:35          | 542                | 214              | 230                   | 230                   |
| 117.50   | 28° 07.1 | 116° 13.9 | 25/04/2004       | 11:57            | 12:16          | 506                | 212              | 209                   | 209                   |
| 117.55   | 27° 56.6 | 116° 33.2 | 25/04/2004       | 18:30            | 18:49          | 679                | 212              | 40                    | 40                    |
| 117.60   | 27° 47.2 | 116° 53.5 | 25/04/2004       | 22:37            | 22:57          | 664                | 216              | 75                    | 75                    |
| 117.65   | 27° 37.6 | 117° 12.8 | 26/04/2004       | 02:57            | 03:17          | 600                | 212              | 90                    | 90                    |
| 117.70   | 27° 27.5 | 117° 31.6 | 26/04/2004       | 06:59            | 07:15          | 442                | 212              | 100                   | 100                   |
| 117.75   | 27° 17.4 | 117° 51.3 | 26/04/2004       | 10:35            | 10:53          | 541                | 214              | 129                   | 129                   |
| 117.80   | 27° 06.5 | 118° 10.2 | 26/04/2004       | 17:42            | 17:58          | 545                | 213              | 101                   | 101                   |
| 119.33   | 28° 17.6 | 114° 52.5 | 28/04/2004       | 22:35            | 22:45          | 304                | 107              | 2449                  | 2449                  |
| 120.30   | 28° 13.2 | 114° 33.7 | 28/04/2004       | 18:27            | 18:34          | 268                | 84               | 1192                  | 1192                  |
| 120.35   | 28° 03.4 | 114° 53.8 | 28/04/2004       | 14:25            | 14:32          | 198                | 70               | 272                   | 272                   |
| 120.39   | 27° 56.3 | 115° 07.6 | 28/04/2004       | 11:26            | 11:29          | 130                | 35               | 131                   | 131                   |
| 120.45   | 27° 42.7 | 115° 32.4 | 28/04/2004       | 06:38            | 06:55          | 544                | 211              | 64                    | 64                    |
| 120.50   | 27° 32.9 | 115° 51.9 | 28/04/2004       | 02:44            | 03:03          | 571                | 211              | 165                   | 165                   |
| 120.55   | 27° 22.9 | 116° 11.1 | 27/04/2004       | 22:27            | 22:48          | 621                | 214              | 97                    | 97                    |
| 120.60   | 27° 12.7 | 116° 30.9 | 27/04/2004       | 18:16            | 18:34          | 555                | 212              | 63                    | 63                    |
| 120.65   | 27° 03.1 | 116° 50.3 | 27/04/2004       | 12:00            | 12:20          | 497                | 209              | 52                    | 52                    |
| 120.70   | 26° 53.2 | 117° 09.1 | 27/04/2004       | 08:14            | 08:32          | 642                | 214              | 23                    | 23                    |
| 120.75   | 26° 43.2 | 117° 28.7 | 27/04/2004       | 04:25            | 04:40          | 384                | 213              | 52                    | 52                    |

|        |          |           |            |       |       |     |     |      |      |
|--------|----------|-----------|------------|-------|-------|-----|-----|------|------|
| 120.80 | 26° 33.1 | 117° 47.9 | 27/04/2004 | 00:27 | 00:46 | 521 | 211 | 84   | 84   |
| 123.42 | 27° 15.0 | 114° 59.4 | 30/04/2004 | 00:59 | 01:19 | 619 | 212 | 262  | 262  |
| 123.45 | 27° 08.5 | 115° 10.8 | 30/04/2004 | 04:08 | 04:24 | 516 | 211 | 175  | 175  |
| 123.50 | 26° 57.7 | 115° 29.7 | 30/04/2004 | 08:42 | 09:02 | 590 | 215 | 109  | 109  |
| 123.55 | 26° 48.9 | 115° 49.6 | 30/04/2004 | 12:23 | 12:43 | 586 | 211 | 85   | 85   |
| 123.60 | 26° 38.3 | 116° 08.9 | 30/04/2004 | 18:51 | 19:10 | 731 | 213 | 47   | 47   |
| 127.35 | 26° 53.7 | 114° 10.1 | 02/05/2004 | 01:59 | 02:06 | 201 | 71  | 458  | 498  |
| 127.40 | 26° 42.7 | 114° 28.4 | 01/05/2004 | 21:54 | 22:12 | 628 | 217 | 135  | 135  |
| 127.45 | 26° 32.7 | 114° 48.1 | 01/05/2004 | 17:30 | 17:45 | 437 | 213 | 123  | 146  |
| 127.50 | 26° 22.8 | 115° 07.5 | 01/05/2004 | 10:04 | 10:23 | 662 | 215 | 21   | 21   |
| 127.55 | 26° 12.8 | 115° 26.6 | 01/05/2004 | 06:11 | 06:26 | 454 | 211 | 31   | 31   |
| 127.60 | 26° 03.3 | 115° 45.7 | 01/05/2004 | 01:57 | 02:17 | 570 | 211 | 79   | 79   |
| 130.30 | 26° 29.4 | 113° 29.5 | 02/05/2004 | 08:32 | 08:39 | 219 | 78  | 201  | 274  |
| 130.35 | 26° 19.5 | 113° 48.8 | 02/05/2004 | 12:05 | 12:25 | 598 | 212 | 154  | 189  |
| 130.40 | 26° 08.9 | 114° 07.4 | 02/05/2004 | 18:45 | 19:05 | 693 | 212 | 241  | 265  |
| 130.45 | 25° 59.2 | 114° 26.7 | 02/05/2004 | 22:58 | 23:19 | 664 | 214 | 127  | 127  |
| 130.50 | 25° 49.3 | 114° 46.1 | 03/05/2004 | 03:28 | 03:48 | 682 | 211 | 120  | 120  |
| 130.55 | 25° 38.3 | 115° 04.6 | 03/05/2004 | 07:34 | 07:50 | 502 | 212 | 72   | 72   |
| 130.60 | 25° 29.3 | 115° 24.4 | 03/05/2004 | 11:03 | 11:22 | 703 | 213 | 26   | 26   |
| 133.25 | 26° 05.1 | 112° 49.1 | 04/05/2004 | 23:51 | 23:57 | 184 | 70  | 1004 | 1048 |
| 133.30 | 25° 54.8 | 113° 08.2 | 04/05/2004 | 20:10 | 20:25 | 570 | 184 | 746  | 767  |
| 133.35 | 25° 44.9 | 113° 26.9 | 04/05/2004 | 16:52 | 17:07 | 557 | 212 | 56   | 56   |
| 133.40 | 25° 35.4 | 113° 45.6 | 04/05/2004 | 13:16 | 13:36 | 592 | 211 | 88   | 88   |
| 133.45 | 25° 25.3 | 114° 05.1 | 04/05/2004 | 07:47 | 08:04 | 624 | 212 | 64   | 64   |
| 133.50 | 25° 15.5 | 114° 24.3 | 04/05/2004 | 04:06 | 04:21 | 489 | 213 | 78   | 78   |
| 133.55 | 25° 05.4 | 114° 43.3 | 04/05/2004 | 00:12 | 00:32 | 619 | 211 | 136  | 136  |
| 133.60 | 24° 55.2 | 115° 02.1 | 03/05/2004 | 20:05 | 20:25 | 689 | 213 | 196  | 196  |
| 137.23 | 25° 29.9 | 112° 27.5 | 05/05/2004 | 05:41 | 05:47 | 220 | 84  | 706  | 997  |
| 137.30 | 25° 20.0 | 112° 46.6 | 05/05/2004 | 08:59 | 09:17 | 465 | 214 | 775  | 775  |
| 137.35 | 25° 10.0 | 113° 05.2 | 05/05/2004 | 13:11 | 13:30 | 531 | 211 | 106  | 106  |
| 137.40 | 24° 59.5 | 113° 24.0 | 05/05/2004 | 16:58 | 17:14 | 495 | 213 | 42   | 42   |
| 137.45 | 24° 49.5 | 113° 43.1 | 05/05/2004 | 20:50 | 21:11 | 706 | 214 | 57   | 57   |
| 137.50 | 24° 39.4 | 114° 02.4 | 06/05/2004 | 00:56 | 01:16 | 665 | 212 | 71   | 71   |
| 137.55 | 24° 29.4 | 114° 21.6 | 06/05/2004 | 04:44 | 05:00 | 563 | 212 | 73   | 137  |
| 137.60 | 24° 19.7 | 114° 40.6 | 06/05/2004 | 08:35 | 08:53 | 620 | 215 | 21   | 34   |

**APÉNDICE I.....continuación**

APPENDIX I.....continuation

**Tabla 3. IMECOCAL 0407**

| ESTACION | LATITUD  | LONGITUD  | FECHA      | HORA     | HORA   | VOLUM.            | PROF.   | BIOMASA               | BIOMASA               |
|----------|----------|-----------|------------|----------|--------|-------------------|---------|-----------------------|-----------------------|
| STATION  | LATITUDE | LONGITUDE | (d/m/a)    | INICIAL  | FINAL  | FILTR.            | MAXIMA  | CHICA                 | TOTAL                 |
|          | (N)      | (W)       | DATE       | STARTING | ENDING | FILTERED          | MAXIMAL | SMALL                 | TOTAL                 |
|          |          |           | (d/m/y)    | HOUR     | HOUR   | VOLUME            | DEPTH   | BIOMASS               | BIOMASS               |
|          |          |           |            | (h:m)    | (h:m)  | (m <sup>3</sup> ) | (m)     | (μl m <sup>-3</sup> ) | (μl m <sup>-3</sup> ) |
| 100.30   | 31° 40.2 | 116° 45.9 | 09/07/2004 | 16:20    | 16:35  | 547               | 213     | 142                   | 142                   |
| 100.35   | 31° 30.2 | 117° 05.8 | 09/07/2004 | 21:43    | 22:01  | 610               | 202     | 82                    | 131                   |
| 100.40   | 31° 21.7 | 117° 27.1 | 10/07/2004 | 02:23    | 02:43  | 591               | 222     | 88                    | 88                    |
| 100.45   | 31° 10.8 | 117° 46.3 | 10/07/2004 | 06:45    | 07:00  | 467               | 214     | 199                   | 199                   |
| 100.50   | 31° 00.1 | 118° 07.2 | 10/07/2004 | 13:47    | 14:06  | 546               | 213     | 73                    | 73                    |
| 100.55   | 30° 50.6 | 118° 26.1 | 10/07/2004 | 18:12    | 18:28  | 543               | 211     | 232                   | 232                   |
| 100.60   | 30° 41.2 | 118° 47.5 | 10/07/2004 | 22:57    | 23:12  | 548               | 200     | 216                   | 216                   |
| 103.30   | 31° 06.9 | 116° 24.5 | 12/07/2004 | 11:00    | 11:04  | 144               | 47      | 180                   | 180                   |
| 103.35   | 30° 57.0 | 116° 44.4 | 12/07/2004 | 06:40    | 06:55  | 433               | 211     | 125                   | 125                   |
| 103.40   | 30° 46.8 | 117° 04.9 | 12/07/2004 | 02:22    | 02:41  | 622               | 173     | 80                    | 90                    |
| 103.45   | 30° 36.9 | 117° 24.7 | 11/07/2004 | 22:16    | 22:35  | 593               | 200     | 160                   | 172                   |
| 103.50   | 30° 26.5 | 117° 43.9 | 11/07/2004 | 18:05    | 18:20  | 424               | 210     | 78                    | 78                    |
| 103.55   | 30° 16.9 | 118° 04.7 | 11/07/2004 | 11:07    | 11:24  | 555               | 199     | 74                    | 74                    |
| 103.60   | 30° 06.5 | 118° 23.6 | 11/07/2004 | 05:34    | 05:49  | 484               | 211     | 54                    | 54                    |
| 107.32   | 30° 26.5 | 116° 09.5 | 12/07/2004 | 16:15    | 16:27  | 421               | 178     | 242                   | 242                   |
| 107.35   | 30° 20.5 | 116° 20.9 | 12/07/2004 | 19:47    | 20:02  | 459               | 211     | 54                    | 54                    |
| 107.40   | 30° 11.4 | 116° 41.8 | 13/07/2004 | 00:04    | 00:23  | 679               | 207     | 169                   | 169                   |
| 107.45   | 30° 01.5 | 117° 01.6 | 13/07/2004 | 04:15    | 04:31  | 443               | 211     | 102                   | 102                   |
| 107.50   | 29° 50.7 | 117° 22.0 | 13/07/2004 | 08:03    | 08:19  | 497               | 209     | 113                   | 113                   |
| 107.55   | 29° 41.4 | 117° 41.5 | 13/07/2004 | 11:32    | 11:48  | 454               | 211     | 22                    | 22                    |
| 107.60   | 29° 30.9 | 118° 01.5 | 13/07/2004 | 17:56    | 18:11  | 448               | 212     | 29                    | 29                    |
| 110.35   | 29° 46.2 | 116° 00.1 | 14/07/2004 | 21:52    | 22:08  | 481               | 207     | 96                    | 96                    |
| 110.40   | 29° 37.2 | 116° 19.5 | 14/07/2004 | 16:52    | 17:07  | 439               | 213     | 25                    | 25                    |
| 110.45   | 29° 27.2 | 116° 39.3 | 14/07/2004 | 11:26    | 11:42  | 439               | 209     | 68                    | 68                    |
| 110.50   | 29° 17.1 | 116° 59.2 | 14/07/2004 | 07:49    | 08:04  | 375               | 211     | 99                    | 112                   |
| 110.55   | 29° 07.1 | 117° 19.1 | 14/07/2004 | 04:02    | 04:16  | 387               | 212     | 124                   | 124                   |
| 110.60   | 28° 57.1 | 117° 38.7 | 13/07/2004 | 23:59    | 00:18  | 616               | 207     | 146                   | 171                   |
| 113.30   | 29° 22.9 | 115° 18.3 | 15/07/2004 | 04:37    | 04:40  | 130               | 49      | 2266                  | 2266                  |
| 113.35   | 29° 13.1 | 115° 38.6 | 15/07/2004 | 08:20    | 08:37  | 538               | 211     | 372                   | 372                   |
| 113.40   | 29° 02.9 | 115° 57.5 | 15/07/2004 | 12:18    | 12:37  | 677               | 209     | 52                    | 65                    |
| 113.45   | 28° 52.6 | 116° 16.9 | 15/07/2004 | 18:26    | 18:45  | 649               | 212     | 83                    | 83                    |
| 113.50   | 28° 42.3 | 116° 36.6 | 15/07/2004 | 22:33    | 22:49  | 440               | 209     | 109                   | 109                   |
| 113.55   | 28° 33.0 | 116° 56.6 | 16/07/2004 | 02:46    | 03:06  | 596               | 209     | 84                    | 84                    |
| 113.60   | 28° 23.1 | 117° 16.7 | 16/07/2004 | 06:25    | 06:40  | 461               | 214     | 252                   | 252                   |
| 117.30   | 28° 47.5 | 114° 55.9 | 18/07/2004 | 13:36    | 13:44  | 244               | 91      | 450                   | 450                   |
| 117.35   | 28° 37.3 | 115° 14.9 | 18/07/2004 | 09:35    | 09:48  | 364               | 169     | 118                   | 118                   |
| 117.40   | 28° 26.8 | 115° 34.8 | 18/07/2004 | 06:01    | 06:16  | 420               | 213     | 62                    | 62                    |
| 117.45   | 28° 17.6 | 115° 54.7 | 18/07/2004 | 00:39    | 01:00  | 514               | 208     | 121                   | 121                   |
| 117.50   | 28° 07.3 | 116° 14.2 | 17/07/2004 | 20:31    | 20:48  | 449               | 209     | 100                   | 118                   |
| 117.55   | 27° 57.7 | 116° 33.2 | 17/07/2004 | 16:47    | 17:01  | 458               | 213     | 179                   | 179                   |
| 117.60   | 27° 47.6 | 116° 53.1 | 17/07/2004 | 10:41    | 10:56  | 455               | 210     | 110                   | 110                   |
| 117.65   | 27° 37.7 | 117° 12.4 | 17/07/2004 | 07:10    | 07:25  | 435               | 212     | 189                   | 189                   |

|        |          |           |            |       |       |     |     |      |      |
|--------|----------|-----------|------------|-------|-------|-----|-----|------|------|
| 117.70 | 27° 27.4 | 117° 32.4 | 17/07/2004 | 03:19 | 03:39 | 591 | 211 | 162  | 190  |
| 117.75 | 27° 17.4 | 117° 50.7 | 16/07/2004 | 23:28 | 23:45 | 495 | 209 | 113  | 113  |
| 117.80 | 27° 07.5 | 118° 10.3 | 16/07/2004 | 19:40 | 19:55 | 487 | 213 | 68   | 68   |
| 119.33 | 28° 17.1 | 114° 52.0 | 18/07/2004 | 17:45 | 17:53 | 234 | 98  | 282  | 282  |
| 120.30 | 28° 13.2 | 114° 34.4 | 19/07/2004 | 20:13 | 20:19 | 215 | 84  | 487  | 487  |
| 120.35 | 28° 03.4 | 114° 53.7 | 20/07/2004 | 01:12 | 01:19 | 212 | 78  | 378  | 378  |
| 120.39 | 27° 54.4 | 115° 07.2 | 20/07/2004 | 03:39 | 03:44 | 111 | 35  | 541  | 541  |
| 120.45 | 27° 42.4 | 115° 31.8 | 20/07/2004 | 08:41 | 08:56 | 419 | 213 | 131  | 179  |
| 120.50 | 27° 33.3 | 115° 52.2 | 20/07/2004 | 12:22 | 12:41 | 529 | 212 | 30   | 30   |
| 120.55 | 27° 22.9 | 116° 11.1 | 20/07/2004 | 18:35 | 18:54 | 593 | 214 | 64   | 64   |
| 120.60 | 27° 13.1 | 116° 30.6 | 20/07/2004 | 22:43 | 23:00 | 488 | 209 | 82   | 82   |
| 120.65 | 27° 03.3 | 116° 50.3 | 21/07/2004 | 02:58 | 03:17 | 539 | 215 | 85   | 85   |
| 120.70 | 26° 53.0 | 117° 09.3 | 21/07/2004 | 07:02 | 07:17 | 450 | 213 | 67   | 67   |
| 120.75 | 26° 42.9 | 117° 28.8 | 21/07/2004 | 10:49 | 11:06 | 510 | 208 | 47   | 47   |
| 120.80 | 26° 33.4 | 117° 48.2 | 21/07/2004 | 16:45 | 17:00 | 419 | 213 | 38   | 38   |
| 123.42 | 27° 14.9 | 114° 59.5 | 23/07/2004 | 02:52 | 03:11 | 752 | 211 | 136  | 169  |
| 123.45 | 27° 09.0 | 115° 11.1 | 22/07/2004 | 22:15 | 22:33 | 527 | 207 | 277  | 288  |
| 123.50 | 26° 58.9 | 115° 30.4 | 22/07/2004 | 17:45 | 18:00 | 352 | 212 | 71   | 71   |
| 123.55 | 26° 48.1 | 115° 50.0 | 22/07/2004 | 10:04 | 10:20 | 443 | 215 | 158  | 172  |
| 123.60 | 26° 37.7 | 116° 08.3 | 22/07/2004 | 05:43 | 05:58 | 447 | 212 | 101  | 101  |
| 127.34 | 26° 53.9 | 114° 10.2 | 23/07/2004 | 11:18 | 11:24 | 202 | 85  | 1289 | 1289 |
| 127.40 | 26° 43.8 | 114° 29.3 | 23/07/2004 | 16:20 | 16:35 | 420 | 212 | 26   | 26   |
| 127.45 | 26° 33.1 | 114° 47.7 | 23/07/2004 | 20:59 | 21:15 | 416 | 210 | 34   | 58   |
| 127.50 | 26° 23.8 | 115° 07.8 | 24/07/2004 | 01:46 | 02:05 | 616 | 212 | 75   | 75   |
| 127.55 | 26° 13.3 | 115° 26.3 | 24/07/2004 | 06:10 | 06:25 | 484 | 212 | 62   | 62   |
| 127.60 | 26° 03.1 | 115° 46.2 | 24/07/2004 | 10:03 | 10:20 | 557 | 208 | 48   | 48   |
| 130.30 | 26° 29.2 | 113° 29.1 | 25/07/2004 | 20:00 | 20:04 | 155 | 64  | 4278 | 6310 |
| 130.35 | 26° 19.5 | 113° 48.3 | 25/07/2004 | 16:31 | 16:46 | 491 | 211 | 118  | 161  |
| 130.40 | 26° 08.5 | 114° 08.3 | 25/07/2004 | 10:20 | 10:36 | 548 | 211 | 155  | 155  |
| 130.45 | 25° 58.5 | 114° 26.9 | 25/07/2004 | 06:22 | 06:37 | 443 | 212 | 43   | 43   |
| 130.50 | 25° 49.3 | 114° 41.3 | 25/07/2004 | 02:27 | 02:46 | 548 | 212 | 69   | 69   |
| 130.55 | 25° 39.1 | 115° 05.0 | 24/07/2004 | 22:33 | 22:50 | 458 | 210 | 52   | 52   |
| 130.60 | 25° 26.3 | 115° 24.5 | 24/07/2004 | 18:23 | 18:42 | 648 | 210 | 455  | 466  |
| 133.25 | 26° 05.2 | 112° 49.3 | 26/07/2004 | 02:15 | 02:22 | 254 | 78  | 767  | 767  |
| 133.30 | 25° 54.8 | 113° 08.1 | 26/07/2004 | 05:40 | 05:53 | 389 | 177 | 283  | 283  |
| 133.35 | 25° 45.4 | 113° 27.5 | 26/07/2004 | 09:31 | 09:47 | 464 | 210 | 172  | 172  |
| 133.40 | 25° 35.1 | 113° 46.4 | 26/07/2004 | 13:12 | 13:31 | 567 | 214 | 37   | 53   |
| 133.45 | 25° 24.2 | 114° 04.7 | 26/07/2004 | 19:04 | 19:19 | 504 | 214 | 123  | 123  |
| 133.50 | 25° 14.2 | 114° 24.3 | 26/07/2004 | 23:09 | 23:27 | 552 | 207 | 52   | 67   |
| 133.55 | 25° 05.2 | 114° 46.5 | 27/07/2004 | 03:13 | 03:32 | 699 | 212 | 59   | 66   |
| 133.60 | 24° 55.0 | 115° 03.2 | 27/07/2004 | 06:44 | 06:59 | 493 | 211 | 32   | 32   |
| 137.25 | 25° 29.7 | 112° 27.3 | 28/07/2004 | 19:57 | 20:03 | 227 | 85  | 507  | 507  |
| 137.30 | 25° 19.8 | 112° 46.1 | 28/07/2004 | 16:19 | 16:34 | 425 | 212 | 104  | 104  |
| 137.35 | 25° 08.0 | 113° 05.5 | 28/07/2004 | 11:58 | 12:18 | 545 | 214 | 73   | 217  |
| 137.40 | 24° 59.0 | 113° 24.3 | 28/07/2004 | 07:37 | 07:52 | 457 | 210 | 87   | 87   |
| 137.45 | 24° 49.7 | 113° 43.6 | 28/07/2004 | 03:35 | 03:54 | 572 | 211 | 73   | 73   |
| 137.50 | 24° 39.1 | 114° 02.1 | 27/07/2004 | 23:10 | 23:27 | 499 | 210 | 128  | 353  |
| 137.55 | 24° 29.7 | 114° 21.1 | 27/07/2004 | 19:07 | 19:22 | 503 | 210 | 74   | 74   |
| 137.60 | 24° 19.8 | 114° 40.5 | 27/07/2004 | 13:22 | 13:41 | 642 | 211 | 75   | 75   |
| 140.30 | 24° 45.5 | 112° 25.4 | 29/07/2004 | 02:30 | 02:38 | 206 | 99  | 271  | 378  |
| 140.35 | 24° 35.4 | 112° 43.4 | 29/07/2004 | 07:13 | 07:28 | 483 | 209 | 135  | 135  |

**APÉNDICE I.....continuación**  
**APPENDIX I.....continuation**

**Tabla 4. IMECOCAL 0410**

| ESTACION | LATITUD  | LONGITUD  | FECHA<br>(d/m/a) | HORA<br>INICIAL  | HORA<br>FINAL  | VOLUM.<br>FILTR.   | PROF.<br>MAXIMA  | BIOMASA<br>CHICA      | BIOMASA<br>TOTAL      |
|----------|----------|-----------|------------------|------------------|----------------|--------------------|------------------|-----------------------|-----------------------|
| STATION  | LATITUDE | LONGITUDE | DATE<br>(d/m/y)  | STARTING<br>HOUR | ENDING<br>HOUR | FILTERED<br>VOLUME | MAXIMAL<br>DEPTH | SMALL<br>BIOMASS      | TOTAL<br>BIOMASS      |
|          | (N)      | (W)       |                  | (h:m)            | (h:m)          | (m <sup>3</sup> )  | (m)              | (µl m <sup>-3</sup> ) | (µl m <sup>-3</sup> ) |
| 100.30   | 31° 40.5 | 116° 46.3 | 09/10/2004       | 17:58            | 18:13          | 450                | 221              | 98                    | 98                    |
| 100.32   | 31° 35.3 | 116° 52.4 | 09/10/2004       | 20:27            | 20:47          | 626                | 212              | 54                    | 54                    |
| 100.35   | 31° 29.9 | 117° 06.1 | 10/10/2004       | 00:10            | 00:29          | 574                | 219              | 49                    | 49                    |
| 100.40   | 31° 20.6 | 117° 26.3 | 10/10/2004       | 05:12            | 05:29          | 385                | 218              | 57                    | 57                    |
| 100.55   | 30° 50.7 | 118° 26.7 | 10/10/2004       | 21:28            | 21:48          | 615                | 213              | 72                    | 72                    |
| 100.60   | 30° 40.9 | 118° 46.4 | 11/10/2004       | 05:28            | 05:45          | 486                | 212              | 62                    | 62                    |
| 103.30   | 31° 06.9 | 116° 24.4 | 12/10/2004       | 14:29            | 14:33          | 116                | 49               | 398                   | 398                   |
| 103.32   | 31° 02.0 | 116° 34.2 | 12/10/2004       | 12:23            | 12:35          | 519                | 213              | 4                     | 4                     |
| 103.35   | 30° 56.4 | 116° 44.3 | 12/10/2004       | 09:33            | 09:52          | 501                | 210              | 36                    | 36                    |
| 103.40   | 30° 47.3 | 117° 04.4 | 12/10/2004       | 05:17            | 05:32          | 402                | 213              | 99                    | 99                    |
| 103.45   | 30° 37.1 | 117° 24.8 | 12/10/2004       | 01:06            | 01:24          | 525                | 213              | 103                   | 103                   |
| 103.50   | 30° 26.6 | 117° 44.6 | 11/10/2004       | 20:51            | 21:10          | 483                | 212              | 75                    | 75                    |
| 103.55   | 30° 16.2 | 118° 03.9 | 11/10/2004       | 16:57            | 17:14          | 441                | 213              | 34                    | 50                    |
| 103.60   | 30° 06.4 | 118° 24.4 | 11/10/2004       | 12:31            | 12:50          | 584                | 204              | 14                    | 46                    |
| 107.32   | 30° 27.5 | 116° 10.2 | 12/10/2004       | 21:40            | 21:59          | 525                | 212              | 88                    | 88                    |
| 107.33   | 30° 24.9 | 116° 11.2 | 12/10/2004       | 23:41            | 00:00          | 569                | 212              | 114                   | 114                   |
| 107.35   | 30° 21.4 | 116° 21.7 | 13/10/2004       | 03:12            | 03:24          | 430                | 213              | 93                    | 93                    |
| 107.40   | 30° 10.6 | 116° 42.0 | 13/10/2004       | 07:22            | 07:37          | 533                | 216              | 41                    | 41                    |
| 107.45   | 30° 01.5 | 117° 01.8 | 13/10/2004       | 10:53            | 11:12          | 478                | 210              | 56                    | 56                    |
| 107.50   | 29° 51.9 | 117° 21.5 | 13/10/2004       | 17:10            | 17:26          | 477                | 212              | 105                   | 105                   |
| 107.55   | 29° 40.2 | 117° 41.4 | 13/10/2004       | 21:33            | 21:52          | 544                | 213              | 88                    | 88                    |
| 107.60   | 29° 31.1 | 118° 01.3 | 14/10/2004       | 01:44            | 02:01          | 544                | 214              | 77                    | 167                   |
| 110.33   | 29° 48.9 | 115° 53.0 | 15/10/2004       | 09:29            | 09:38          | 245                | 98               | 86                    | 86                    |
| 110.35   | 29° 46.4 | 115° 59.7 | 15/10/2004       | 07:36            | 07:51          | 447                | 213              | 80                    | 80                    |
| 110.37   | 29° 42.4 | 116° 07.7 | 15/10/2004       | 05:08            | 05:23          | 384                | 212              | 117                   | 117                   |
| 110.40   | 29° 36.2 | 116° 19.1 | 15/10/2004       | 01:31            | 01:47          | 496                | 211              | 103                   | 103                   |
| 110.45   | 29° 26.7 | 116° 39.4 | 14/10/2004       | 20:56            | 21:15          | 490                | 210              | 106                   | 106                   |
| 110.50   | 29° 16.4 | 116° 59.2 | 14/10/2004       | 16:40            | 16:56          | 437                | 215              | 181                   | 181                   |
| 110.55   | 29° 07.0 | 117° 18.7 | 14/10/2004       | 12:30            | 12:45          | 473                | 212              | 78                    | 78                    |
| 110.60   | 28° 56.9 | 117° 38.0 | 14/10/2004       | 08:26            | 08:46          | 506                | 211              | 51                    | 51                    |
| 113.30   | 29° 23.0 | 115° 18.2 | 15/10/2004       | 15:30            | 15:34          | 180                | 58               | 283                   | 283                   |
| 113.34   | 29° 14.8 | 115° 32.4 | 15/10/2004       | 18:36            | 18:54          | 512                | 216              | 68                    | 68                    |
| 113.35   | 29° 12.2 | 115° 37.4 | 15/10/2004       | 20:42            | 21:01          | 552                | 211              | 149                   | 149                   |
| 113.40   | 29° 02.2 | 115° 56.9 | 16/10/2004       | 01:21            | 01:37          | 517                | 214              | 85                    | 85                    |
| 113.45   | 28° 52.7 | 116° 16.9 | 16/10/2004       | 05:27            | 05:42          | 452                | 214              | 126                   | 195                   |
| 113.50   | 28° 42.8 | 116° 36.9 | 16/10/2004       | 09:14            | 09:33          | 463                | 211              | 61                    | 84                    |
| 113.55   | 28° 32.4 | 116° 55.9 | 16/10/2004       | 15:47            | 16:03          | 547                | 211              | 44                    | 44                    |
| 113.60   | 28° 23.3 | 117° 15.6 | 16/10/2004       | 20:04            | 20:22          | 475                | 212              | 44                    | 44                    |
| 117.30   | 28° 47.5 | 114° 55.9 | 19/10/2004       | 06:01            | 06:07          | 196                | 86               | 255                   | 255                   |
| 117.35   | 28° 37.1 | 115° 14.1 | 19/10/2004       | 02:25            | 02:38          | 520                | 171              | 71                    | 94                    |
| 117.40   | 28° 27.3 | 115° 34.6 | 18/10/2004       | 21:24            | 21:43          | 484                | 210              | 74                    | 74                    |

|        |          |           |            |       |       |     |     |     |     |
|--------|----------|-----------|------------|-------|-------|-----|-----|-----|-----|
| 117.43 | 28° 21.1 | 115° 45.3 | 18/10/2004 | 18:40 | 18:56 | 405 | 216 | 39  | 39  |
| 117.45 | 28° 16.8 | 115° 55.0 | 18/10/2004 | 15:47 | 16:02 | 696 | 212 | 14  | 14  |
| 117.50 | 28° 07.3 | 116° 14.2 | 18/10/2004 | 09:17 | 09:36 | 440 | 211 | 39  | 39  |
| 117.55 | 27° 57.6 | 116° 33.2 | 18/10/2004 | 05:54 | 06:10 | 524 | 212 | 80  | 80  |
| 117.60 | 27° 47.4 | 116° 52.5 | 18/10/2004 | 01:49 | 02:05 | 517 | 212 | 58  | 58  |
| 117.65 | 27° 37.5 | 117° 12.5 | 17/10/2004 | 21:42 | 22:01 | 489 | 210 | 98  | 113 |
| 117.70 | 27° 27.3 | 117° 31.9 | 17/10/2004 | 17:41 | 17:56 | 468 | 211 | 201 | 201 |
| 117.75 | 27° 17.6 | 117° 50.6 | 17/10/2004 | 13:50 | 14:06 | 578 | 211 | 90  | 90  |
| 117.80 | 27° 07.3 | 118° 09.9 | 17/10/2004 | 09:59 | 10:18 | 521 | 211 | 35  | 35  |
| 119.33 | 28° 17.1 | 114° 51.5 | 19/10/2004 | 09:58 | 10:07 | 282 | 99  | 78  | 78  |
| 120.30 | 28° 13.3 | 114° 34.4 | 20/10/2004 | 17:29 | 17:35 | 178 | 86  | 84  | 84  |
| 120.35 | 28° 03.2 | 114° 53.3 | 20/10/2004 | 20:59 | 21:06 | 168 | 79  | 655 | 655 |
| 120.39 | 27° 56.4 | 115° 07.3 | 20/10/2004 | 23:55 | 23:58 | 70  | 28  | 201 | 201 |
| 120.43 | 27° 48.0 | 115° 26.5 | 21/10/2004 | 04:02 | 04:18 | 425 | 218 | 52  | 52  |
| 120.45 | 27° 44.3 | 115° 32.5 | 21/10/2004 | 06:26 | 06:43 | 538 | 214 | 37  | 37  |
| 120.50 | 27° 32.7 | 115° 50.8 | 21/10/2004 | 12:33 | 12:52 | 650 | 219 | 48  | 48  |
| 120.55 | 27° 22.6 | 116° 11.0 | 21/10/2004 | 18:42 | 18:58 | 440 | 215 | 61  | 61  |
| 120.60 | 27° 12.7 | 116° 30.8 | 21/10/2004 | 22:58 | 23:18 | 566 | 212 | 71  | 71  |
| 120.65 | 27° 03.1 | 116° 50.4 | 22/10/2004 | 03:03 | 03:18 | 470 | 213 | 72  | 72  |
| 120.70 | 26° 52.8 | 117° 09.6 | 22/10/2004 | 06:50 | 07:07 | 517 | 213 | 54  | 54  |
| 120.75 | 26° 43.0 | 117° 28.8 | 22/10/2004 | 10:23 | 10:42 | 512 | 212 | 47  | 47  |
| 120.80 | 26° 32.7 | 117° 48.3 | 22/10/2004 | 16:02 | 16:18 | 441 | 213 | 50  | 50  |
| 123.41 | 27° 16.5 | 114° 56.4 | 24/10/2004 | 01:10 | 01:28 | 590 | 212 | 115 | 115 |
| 123.42 | 27° 14.7 | 114° 59.2 | 23/10/2004 | 23:25 | 23:44 | 443 | 211 | 138 | 219 |
| 123.45 | 27° 08.3 | 115° 10.9 | 23/10/2004 | 20:01 | 20:20 | 497 | 212 | 137 | 137 |
| 123.47 | 27° 03.0 | 115° 18.7 | 23/10/2004 | 17:14 | 17:30 | 442 | 211 | 99  | 99  |
| 123.50 | 26° 58.6 | 115° 30.0 | 23/10/2004 | 14:27 | 14:45 | 537 | 214 | 93  | 93  |
| 123.55 | 26° 48.4 | 115° 49.5 | 23/10/2004 | 10:23 | 10:41 | 456 | 212 | 46  | 46  |
| 123.60 | 26° 38.0 | 116° 09.2 | 23/10/2004 | 05:59 | 06:16 | 487 | 212 | 90  | 90  |
| 127.34 | 26° 53.7 | 114° 10.3 | 24/10/2004 | 08:21 | 08:27 | 174 | 79  | 149 | 454 |
| 127.36 | 26° 51.7 | 114° 15.0 | 24/10/2004 | 10:00 | 10:19 | 487 | 213 | 45  | 76  |
| 127.40 | 26° 43.8 | 114° 29.8 | 24/10/2004 | 13:29 | 13:47 | 479 | 212 | 63  | 63  |
| 127.45 | 26° 33.2 | 114° 47.9 | 24/10/2004 | 19:57 | 20:17 | 468 | 213 | 83  | 103 |
| 127.50 | 26° 23.1 | 115° 07.1 | 25/10/2004 | 01:03 | 01:19 | 452 | 216 | 106 | 106 |
| 127.55 | 26° 13.5 | 115° 26.0 | 25/10/2004 | 05:17 | 05:36 | 456 | 218 | 103 | 103 |
| 127.60 | 26° 03.3 | 115° 45.3 | 25/10/2004 | 09:56 | 10:14 | 471 | 210 | 59  | 59  |
| 130.30 | 26° 29.3 | 113° 29.5 | 26/10/2004 | 17:12 | 17:18 | 210 | 71  | 219 | 219 |
| 130.35 | 26° 19.4 | 113° 48.7 | 26/10/2004 | 13:32 | 13:50 | 567 | 214 | 62  | 76  |
| 130.40 | 26° 08.3 | 114° 07.6 | 26/10/2004 | 09:36 | 09:55 | 367 | 211 | 33  | 33  |
| 130.45 | 25° 58.1 | 114° 26.3 | 26/10/2004 | 05:19 | 05:35 | 459 | 211 | 59  | 59  |
| 130.50 | 25° 48.4 | 114° 45.4 | 26/10/2004 | 01:10 | 01:28 | 463 | 212 | 54  | 54  |
| 130.55 | 25° 38.3 | 115° 05.0 | 25/10/2004 | 20:37 | 20:56 | 388 | 211 | 57  | 57  |
| 130.60 | 25° 28.8 | 115° 24.1 | 25/10/2004 | 16:17 | 16:34 | 440 | 212 | 77  | 89  |
| 133.25 | 26° 05.1 | 112° 49.1 | 26/10/2004 | 23:43 | 23:50 | 181 | 77  | 481 | 481 |
| 133.30 | 25° 54.8 | 113° 07.9 | 27/10/2004 | 03:17 | 03:32 | 405 | 180 | 124 | 400 |
| 133.35 | 25° 45.3 | 113° 27.0 | 27/10/2004 | 07:32 | 07:49 | 518 | 216 | 68  | 87  |
| 133.40 | 25° 35.2 | 113° 46.3 | 27/10/2004 | 11:08 | 11:27 | 468 | 211 | 79  | 79  |
| 133.45 | 25° 24.7 | 114° 05.1 | 27/10/2004 | 17:02 | 17:19 | 603 | 214 | 75  | 75  |

**APÉNDICE I.....continuación**

**APPENDIX I.....continuation**

**Tabla 5.** Abundancia y volumen de organismos grandes excluidos de la medición de biomasa chica.

Table 5. Abundance and volume of large organisms excluded in the measurement of small biomass.

| CRUCERO                        | ESTACION | ABUND. | VOL. | CRUCERO                      | ESTACION | ABUND. | VOL. | CRUCERO           | ESTACION | ABUND. | VOL. |
|--------------------------------|----------|--------|------|------------------------------|----------|--------|------|-------------------|----------|--------|------|
| CRUISE                         | STATION  | (ind)  | (ml) | CRUISE                       | STATION  | (ind)  | (ml) | CRUISE            | STATION  | (ind)  | (ml) |
| <i>Pteropoda (Corolla sp.)</i> |          |        |      | <i>Pleuroncodes planipes</i> |          |        |      | <i>Heteropoda</i> |          |        |      |
| 0402                           | 103.35   | 4      | 30   | 0402                         | 120.35   | 2      | 5    | 0402              | 127.40   | 2      | 5    |
| 0402                           | 107.40   | ?      | 11   | 0402                         | 127.35   | 14     | 38   | 0402              | 130.45   | 4      | 9    |
| 0402                           | 107.45   | ?      | 14   | 0402                         | 133.25   | 11     | 16   | 0404              | 127.35   | 3      | 8    |
| 0402                           | 107.55   | 2      | 5    | 0404                         | 127.45   | 3      | 10   | 0404              | 137.55   | 2      | 36   |
| 0402                           | 110.60   | 1      | 8    | 0404                         | 130.35   | 9      | 21   | 0407              | 103.40   | 1      | 6    |
| 0402                           | 113.45   | ?      | 7    | 0404                         | 133.25   | 2      | 8    | 0407              | 103.45   | 1      | 7    |
| 0402                           | 113.50   | ?      | 20   | 0404                         | 133.30   | 6      | 12   | 0407              | 110.50   | 1      | 5    |
| 0402                           | 113.55   | ?      | 11   | 0404                         | 137.23   | 23     | 64   | 0407              | 117.70   | 6      | 7    |
| 0402                           | 117.45   | 1      | 7    | 0404                         | 137.60   | 5      | 8    | 0407              | 123.55   | 1      | 6    |
| 0402                           | 117.50   | ?      | 19   | 0407                         | 113.40   | 1      | 9    | 0407              | 137.50   | 2      | 6    |
| 0402                           | 120.50   | ?      | 20   | 0407                         | 130.30   | 96     | 315  | 0410              | 117.35   | 2      | 12   |
| 0402                           | 120.55   | 1      | 6    | 0407                         | 130.35   | 7      | 21   | 0410              | 117.65   | 1      | 7    |
| 0402                           | 123.45   | ?      | 5    | 0407                         | 133.40   | 3      | 9    | 0410              | 123.42   | 3      | 27   |
| 0402                           | 123.50   | ?      | 6    | 0407                         | 133.55   | 2      | 5    | 0410              | 127.45   | 1      | 9    |
| 0402                           | 130.35   | 1      | 11   | 0407                         | 137.35   | 56     | 78   | <i>Salpida</i>    |          |        |      |
| 0404                           | 113.30   | ?      | 7    | 0407                         | 140.30   | 5      | 22   | 0402              | 120.70   | 1      | 51   |
| 0404                           | 130.30   | ?      | 16   | 0410                         | 127.34   | 9      | 53   | 0404              | 100.40   | 1      | 5    |
| 0404                           | 130.40   | ?      | 17   | 0410                         | 127.36   | 11     | 15   | 0404              | 103.55   | 8      | 16   |
| <i>Stomatopoda larvae</i>      |          |        |      | 0410                         | 130.35   | 6      | 8    | 0407              | 100.35   | 1      | 30   |
| 0407                           | 110.60   | 63     | 15   | 0410                         | 130.60   | 3      | 5    | 0407              | 120.45   | 7      | 14   |
| 0407                           | 117.50   | 14     | 8    | 0410                         | 133.30   | 40     | 112  | 0407              | 137.50   | 35     | 98   |
| 0407                           | 117.70   | 39     | 9    | 0410                         | 133.35   | 7      | 10   | 0410              | 103.55   | 1      | 7    |
| 0407                           | 120.45   | 20     | 6    | <i>Cephalopoda</i>           |          |        |      | 0410              | 103.60   | 11     | 19   |
| 0407                           | 123.42   | 100    | 25   | 0404                         | 113.40   | 2      | 5    | 0410              | 107.60   | 14     | 49   |
| 0407                           | 123.45   | 20     | 6    | <i>Ctenophora</i>            |          |        |      | 0410              | 113.45   | 8      | 31   |
| 0407                           | 127.45   | 28     | 10   | 0410                         | 123.42   | 1      | 9    | 0410              | 113.50   | 4      | 11   |
| 0407                           | 130.60   | 22     | 7    |                              |          |        |      |                   |          |        |      |
| 0407                           | 133.50   | 31     | 8    |                              |          |        |      |                   |          |        |      |
| 0407                           | 137.50   | 25     | 8    |                              |          |        |      |                   |          |        |      |

**8. APÉNDICE II.– DATOS DE ABUNDANCIA DE ZOOPLANKTON (ind m<sup>-3</sup>) POR GRUPOS TAXONÓMICOS**  
**APPENDIX II. – DATA OF ZOOPLANKTON ABUNDANCE (ind m<sup>-3</sup>) BY TAXONOMIC GROUPS**

**Tabla 6. IMECOCAL 0402**

| <b>Taxa</b>         | <b>100.30</b> | <b>100.35</b> | <b>103.30</b> | <b>103.35</b> | <b>103.50</b> | <b>107.30</b> | <b>107.35</b> | <b>107.50</b> | <b>107.55</b> | <b>107.60</b> | <b>110.45</b> | <b>110.50</b> | <b>113.35</b> | <b>113.40</b> | <b>113.60</b> |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Medusae             | 0.202         | 0.000         | 0.073         | 0.022         | 0.018         | 0.035         | 0.043         | 0.028         | 0.032         | 0.221         | 0.016         | 0.000         | 0.057         | 0.000         | 0.207         |
| Siphonophora        | 0.202         | 0.304         | 1.600         | 0.123         | 0.920         | 0.000         | 0.101         | 3.699         | 4.940         | 4.593         | 0.500         | 1.233         | 1.202         | 1.460         | 1.328         |
| Ctenophora          | 0.000         | 0.003         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.004         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Pteropoda           | 0.000         | 0.203         | 0.000         | 0.191         | 1.294         | 0.035         | 0.072         | 0.224         | 2.932         | 0.676         | 0.115         | 0.310         | 0.286         | 0.386         | 1.771         |
| Heteropoda          | 0.000         | 0.304         | 0.000         | 0.303         | 0.035         | 0.000         | 0.116         | 1.569         | 0.223         | 0.124         | 0.242         | 1.233         | 0.229         | 1.597         | 0.118         |
| Cephalopoda         | 0.000         | 0.000         | 0.000         | 0.000         | 0.053         | 0.000         | 0.002         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.002         | 0.000         | 0.000         |
| Polychaeta          | 0.000         | 0.041         | 0.000         | 0.011         | 0.000         | 0.000         | 0.000         | 0.084         | 0.000         | 0.207         | 0.065         | 0.260         | 0.114         | 0.165         | 0.000         |
| Cladocera           | 0.554         | 0.000         | 4.945         | 0.000         | 0.053         | 0.035         | 0.072         | 0.364         | 2.741         | 0.152         | 0.065         | 0.097         | 0.114         | 0.248         | 2.391         |
| Ostracoda           | 0.151         | 1.114         | 0.145         | 0.954         | 0.673         | 0.070         | 0.794         | 2.326         | 2.518         | 0.662         | 1.194         | 2.402         | 1.317         | 1.212         | 3.100         |
| Copepoda            | 34.520        | 6.056         | 63.418        | 11.130        | 2.460         | 67.066        | 13.877        | 17.233        | 23.490        | 7.683         | 7.468         | 10.515        | 19.034        | 17.542        | 17.535        |
| Amphipoda           | 0.000         | 0.041         | 0.073         | 0.123         | 0.106         | 0.000         | 0.029         | 0.252         | 0.478         | 0.166         | 0.210         | 0.243         | 0.229         | 0.220         | 0.266         |
| Euphausiacea        | 1.487         | 1.296         | 0.582         | 0.774         | 1.540         | 3.137         | 1.069         | 0.953         | 4.558         | 1.200         | 1.371         | 1.039         | 0.572         | 2.065         | 3.897         |
| Decapoda            | 0.000         | 0.000         | 0.000         | 0.034         | 0.020         | 0.282         | 0.072         | 0.056         | 0.096         | 0.041         | 0.018         | 0.081         | 0.086         | 0.165         | 0.065         |
| Chaetognata         | 0.479         | 0.385         | 8.436         | 0.180         | 0.531         | 4.758         | 0.419         | 2.886         | 4.558         | 1.517         | 0.919         | 2.110         | 1.059         | 1.928         | 1.860         |
| Apendicularia       | 2.016         | 0.162         | 7.855         | 0.000         | 0.124         | 0.811         | 0.563         | 3.643         | 3.697         | 0.772         | 1.081         | 1.493         | 0.658         | 0.964         | 1.476         |
| Doliolidae          | 0.050         | 0.142         | 0.000         | 0.045         | 0.177         | 0.000         | 0.029         | 0.588         | 1.434         | 0.428         | 0.161         | 0.422         | 0.143         | 0.496         | 0.266         |
| Salpidae            | 0.000         | 0.000         | 0.000         | 0.000         | 0.071         | 0.000         | 0.000         | 0.224         | 0.956         | 0.138         | 0.097         | 0.000         | 0.029         | 0.083         | 0.089         |
| Pyrosomidae         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Polychaeta larva    | 0.025         | 0.020         | 0.000         | 0.011         | 0.071         | 0.035         | 0.014         | 0.000         | 0.637         | 0.000         | 0.000         | 0.081         | 0.029         | 0.110         | 0.148         |
| Cirripedia larva    | 0.000         | 0.061         | 0.291         | 0.022         | 0.000         | 0.000         | 0.000         | 0.056         | 0.000         | 0.028         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Stomatopoda larva   | 0.504         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Echinodermata larva | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Invertebrate larvae | 0.025         | 0.000         | 0.873         | 0.011         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Pisces larvae       | 0.277         | 0.061         | 0.073         | 0.079         | 0.124         | 0.352         | 0.173         | 0.112         | 0.319         | 0.055         | 0.081         | 0.195         | 0.315         | 0.055         | 0.148         |
| Pisces eggs         | 0.050         | 0.101         | 0.291         | 0.000         | 0.088         | 0.000         | 0.014         | 0.448         | 1.434         | 0.041         | 0.194         | 0.341         | 0.057         | 0.000         | 0.177         |
| <b>Total</b>        | <b>40.139</b> | <b>9.438</b>  | <b>86.982</b> | <b>13.363</b> | <b>6.038</b>  | <b>76.546</b> | <b>17.126</b> | <b>29.142</b> | <b>46.916</b> | <b>12.883</b> | <b>12.857</b> | <b>19.018</b> | <b>23.642</b> | <b>25.088</b> | <b>31.415</b> |



| Taxa                | 117.35 | 117.40 | 117.45 | 117.60 | 117.65 | 117.70  | 120.35  | 120.40 | 120.45 | 120.65 | 120.70 | 120.75 | 123.42 | 123.55 | 123.60 |
|---------------------|--------|--------|--------|--------|--------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| Medusae             | 0.087  | 0.192  | 0.231  | 0.071  | 0.000  | 0.796   | 0.684   | 1.095  | 0.390  | 0.000  | 0.854  | 0.961  | 1.290  | 0.391  | 0.603  |
| Siphonophora        | 1.758  | 3.123  | 2.167  | 0.496  | 1.583  | 5.343   | 8.556   | 1.937  | 0.585  | 3.741  | 8.484  | 5.704  | 2.000  | 3.556  | 3.233  |
| Ctenophora          | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Pteropoda           | 1.227  | 3.207  | 3.919  | 0.708  | 0.432  | 1.478   | 4.449   | 0.842  | 0.111  | 1.468  | 0.626  | 4.443  | 1.290  | 0.249  | 0.603  |
| Heteropoda          | 0.068  | 0.082  | 0.046  | 0.071  | 0.058  | 0.002   | 0.684   | 1.516  | 0.028  | 0.230  | 0.114  | 0.600  | 0.002  | 0.107  | 0.164  |
| Cephalopoda         | 0.019  | 0.027  | 0.001  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.002  | 0.000  | 0.000  | 0.060  | 0.002  | 0.000  | 0.000  |
| Polychaeta          | 0.000  | 0.027  | 0.000  | 0.071  | 0.058  | 0.000   | 0.000   | 0.000  | 0.028  | 0.000  | 0.171  | 0.000  | 0.000  | 0.000  | 0.000  |
| Cladocera           | 0.010  | 0.027  | 0.184  | 0.142  | 0.806  | 0.341   | 0.000   | 0.000  | 0.000  | 1.007  | 1.253  | 0.240  | 0.000  | 0.000  | 0.658  |
| Ostracoda           | 0.415  | 1.233  | 2.167  | 0.212  | 0.432  | 3.240   | 0.000   | 0.084  | 2.118  | 1.324  | 1.139  | 1.201  | 1.419  | 1.493  | 1.260  |
| Copepoda            | 3.034  | 13.288 | 25.222 | 3.469  | 13.036 | 53.996  | 26.695  | 11.200 | 13.659 | 18.820 | 23.345 | 23.835 | 31.871 | 25.600 | 19.1   |
| Amphipoda           | 0.155  | 0.219  | 0.277  | 1.416  | 0.173  | 0.455   | 0.000   | 0.000  | 0.056  | 0.058  | 0.057  | 0.120  | 0.194  | 0.107  | 0.274  |
| Euphausiacea        | 1.082  | 1.973  | 1.291  | 1.416  | 1.813  | 7.503   | 24.299  | 11.537 | 1.477  | 5.295  | 4.669  | 4.203  | 7.226  | 5.831  | 1.315  |
| Decapoda            | 0.039  | 0.027  | 0.046  | 0.000  | 0.002  | 0.057   | 8.898   | 16.168 | 0.502  | 0.058  | 0.000  | 0.060  | 0.077  | 0.002  | 0.274  |
| Chaetognata         | 0.415  | 1.068  | 0.415  | 0.071  | 2.763  | 18.586  | 0.000   | 0.168  | 0.084  | 7.482  | 6.662  | 7.144  | 5.226  | 8.853  | 11.014 |
| Apendicularia       | 0.048  | 0.712  | 0.553  | 0.000  | 1.583  | 11.822  | 3.080   | 6.063  | 0.167  | 5.784  | 5.466  | 4.083  | 2.516  | 1.778  | 2.137  |
| Doliolidae          | 0.019  | 0.027  | 0.000  | 0.071  | 0.230  | 2.956   | 0.000   | 0.000  | 0.000  | 2.561  | 3.701  | 3.242  | 0.000  | 0.356  | 1.315  |
| Salpidae            | 0.029  | 0.055  | 10.836 | 43.257 | 0.000  | 2.560   | 179.337 | 10.105 | 7.108  | 0.460  | 1.765  | 7.024  | 26.387 | 0.569  | 1.041  |
| Pyrosomidae         | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Polychaeta larva    | 0.097  | 0.521  | 0.231  | 0.000  | 0.058  | 0.114   | 0.000   | 0.000  | 0.028  | 0.288  | 0.000  | 0.480  | 0.000  | 0.178  | 0.164  |
| Cirripedia larva    | 0.010  | 0.027  | 0.046  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Stomatopoda larva   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.057   | 0.684   | 1.684  | 0.084  | 0.000  | 0.000  | 0.000  | 0.000  | 0.036  | 0.877  |
| Echinodermata larva | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.029  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Invertebrate larvae | 0.000  | 0.000  | 0.000  | 0.000  | 0.029  | 0.000   | 0.342   | 0.084  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Pisces larvae       | 0.135  | 0.247  | 0.046  | 0.000  | 0.058  | 1.648   | 0.000   | 0.000  | 0.028  | 0.432  | 0.342  | 0.660  | 0.323  | 0.604  | 0.548  |
| Pisces eggs         | 0.077  | 0.000  | 0.046  | 0.142  | 0.144  | 0.284   | 0.000   | 0.084  | 0.028  | 0.029  | 0.000  | 0.000  | 4.258  | 0.071  | 0.055  |
| Total               | 5.565  | 19.425 | 41.360 | 50.195 | 21.124 | 103.618 | 243.337 | 57.179 | 25.338 | 43.626 | 48.399 | 52.293 | 79.496 | 45.478 | 40.0   |

| <b>Taxa</b>         | <b>127.35</b>  | <b>127.40</b> | <b>127.55</b> | <b>127.60</b> | <b>130.35</b> | <b>130.40</b> | <b>130.45</b> | <b>133.35</b> |
|---------------------|----------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Medusae             | 1.333          | 0.208         | 0.376         | 0.551         | 0.453         | 1.209         | 1.134         | 1.042         |
| Siphonophora        | 7.667          | 4.998         | 3.230         | 4.627         | 2.642         | 7.680         | 6.173         | 7.356         |
| Ctenophora          | 0.000          | 0.000         | 0.002         | 0.000         | 0.024         | 0.027         | 0.008         | 0.000         |
| Pteropoda           | 0.333          | 0.555         | 0.829         | 0.661         | 0.453         | 0.782         | 1.260         | 0.368         |
| Heteropoda          | 0.000          | 0.208         | 0.380         | 0.110         | 0.007         | 0.007         | 0.063         | 0.000         |
| Cephalopoda         | 0.000          | 0.002         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.123         |
| Polychaeta          | 0.000          | 0.000         | 0.075         | 0.000         | 0.528         | 0.071         | 0.315         | 0.184         |
| Cladocera           | 0.000          | 0.069         | 5.333         | 0.881         | 0.000         | 0.711         | 3.339         | 0.000         |
| Ostracoda           | 1.667          | 2.152         | 2.479         | 2.534         | 1.509         | 2.133         | 1.008         | 1.226         |
| Copepoda            | 158.333        | 23.115        | 29.822        | 24.014        | 10.906        | 25.671        | 16.126        | 24.337        |
| Amphipoda           | 0.333          | 0.208         | 0.601         | 0.330         | 0.113         | 0.071         | 0.504         | 0.368         |
| Euphausiacea        | 33.000         | 3.471         | 3.906         | 7.601         | 5.245         | 5.689         | 4.787         | 10.728        |
| Decapoda            | 124.333        | 2.013         | 0.453         | 0.110         | 0.167         | 0.356         | 0.315         | 7.111         |
| Chaetognata         | 12.000         | 23.740        | 15.624        | 30.182        | 9.094         | 15.644        | 18.142        | 9.870         |
| Apendicularia       | 6.000          | 0.833         | 1.653         | 6.169         | 0.453         | 4.978         | 7.307         | 7.356         |
| Doliolidae          | 0.333          | 0.208         | 1.277         | 1.322         | 0.189         | 1.067         | 2.898         | 1.349         |
| Salpidae            | 1.000          | 0.416         | 0.300         | 0.330         | 0.453         | 1.573         | 1.575         | 3.249         |
| Pyrosomidae         | 0.000          | 0.000         | 0.000         | 0.000         | 0.000         | 0.002         | 0.000         | 0.000         |
| Polychaeta larva    | 0.000          | 0.486         | 0.451         | 0.661         | 0.000         | 0.000         | 0.063         | 0.184         |
| Cirripedia larva    | 0.000          | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Stomatopoda larva   | 0.005          | 0.347         | 0.376         | 2.423         | 0.075         | 0.427         | 0.756         | 0.490         |
| Echinodermata larva | 0.000          | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Invertebrate larvae | 0.000          | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.061         |
| Pisces larvae       | 0.667          | 0.764         | 0.075         | 0.220         | 0.226         | 1.209         | 1.071         | 0.797         |
| Pisces eggs         | 0.333          | 0.069         | 0.075         | 0.330         | 0.377         | 0.284         | 0.252         | 3.678         |
| <b>Total</b>        | <b>338.005</b> | <b>57.892</b> | <b>62.425</b> | <b>77.108</b> | <b>28.809</b> | <b>59.816</b> | <b>58.142</b> | <b>70.805</b> |

**APÉNDICE II.....continuación**  
**APPENDIX II.....continuation**

**Tabla 7. IMECOCAL 0404**

| <b>Taxa</b>          | <b>100.40</b> | <b>100.45</b> | <b>100.60</b> | <b>103.60</b> | <b>113.35</b> | <b>113.40</b> | <b>113.60</b> | <b>117.35</b> | <b>117.40</b> | <b>117.60</b> | <b>117.65</b> | <b>119.33</b>   | <b>120.50</b> | <b>120.55</b> | <b>120.75</b> |
|----------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------------|---------------|---------------|---------------|
| Medusae              | 0.096         | 0.000         | 0.127         | 0.033         | 0.000         | 0.000         | 0.035         | 0.033         | 0.000         | 0.000         | 0.040         | 0.000           | 0.000         | 0.077         | 0.031         |
| Siphonophora         | 1.890         | 9.655         | 8.523         | 2.825         | 20.768        | 7.865         | 3.646         | 4.207         | 3.316         | 8.771         | 0.307         | 1.684           | 0.448         | 0.541         | 0.458         |
| Ctenophora           | 0.000         | 0.000         | 0.032         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000           | 0.000         | 0.000         | 0.010         |
| Pteropoda            | 1.360         | 1.559         | 5.956         | 1.906         | 2.543         | 1.854         | 0.690         | 0.629         | 2.051         | 0.627         | 0.587         | 0.000           | 2.858         | 0.928         | 0.635         |
| Heteropoda           | 0.480         | 0.547         | 0.634         | 1.183         | 0.106         | 0.000         | 1.257         | 0.099         | 1.573         | 7.325         | 0.267         | 0.000           | 0.280         | 0.412         | 0.083         |
| Cephalopoda          | 0.010         | 0.027         | 0.032         | 0.000         | 0.005         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000           | 0.000         | 0.000         | 0.000         |
| Polychaeta           | 0.077         | 0.109         | 0.349         | 0.296         | 0.212         | 0.179         | 0.159         | 0.000         | 0.103         | 0.217         | 0.080         | 0.000           | 0.056         | 0.335         | 0.021         |
| Cladocera            | 0.067         | 0.027         | 0.063         | 0.033         | 1.483         | 0.000         | 0.053         | 1.689         | 0.000         | 0.506         | 0.080         | 0.000           | 0.336         | 0.000         | 0.063         |
| Ostracoda            | 0.365         | 0.602         | 0.919         | 0.460         | 0.848         | 0.000         | 0.584         | 0.000         | 0.342         | 0.530         | 0.933         | 0.000           | 4.035         | 2.061         | 0.979         |
| Copepoda             | 8.432         | 19.091        | 47.271        | 34.070        | 52.980        | 18.961        | 9.221         | 14.311        | 31.829        | 21.060        | 16.427        | 1306.105        | 38.445        | 18.138        | 14.802        |
| Amphipoda            | 0.230         | 0.328         | 1.014         | 0.789         | 0.636         | 0.299         | 0.319         | 0.265         | 0.821         | 0.675         | 0.080         | 0.000           | 0.336         | 0.464         | 0.156         |
| Mysidacea            | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.842           | 0.000         | 0.000         | 0.000         |
| Euphausiacea         | 0.825         | 2.407         | 4.689         | 2.793         | 31.894        | 3.110         | 1.681         | 17.391        | 2.769         | 3.060         | 5.947         | 218.947         | 16.644        | 13.192        | 4.302         |
| Decapoda             | 0.010         | 0.000         | 0.127         | 0.068         | 0.000         | 0.120         | 0.071         | 0.033         | 0.034         | 0.114         | 0.123         | 26.947          | 0.112         | 0.362         | 0.208         |
| Chaetognatha         | 1.468         | 3.227         | 4.911         | 1.610         | 2.437         | 1.705         | 3.062         | 0.497         | 0.479         | 3.133         | 3.960         | 4.211           | 3.419         | 2.010         | 1.479         |
| Appendicularia       | 0.518         | 0.738         | 3.770         | 5.651         | 0.954         | 0.209         | 0.071         | 0.099         | 0.137         | 0.482         | 1.293         | 0.000           | 2.970         | 0.618         | 4.021         |
| Doliolidae           | 0.115         | 0.410         | 2.693         | 0.164         | 0.212         | 0.239         | 1.168         | 0.166         | 0.068         | 1.084         | 1.147         | 0.000           | 0.224         | 0.052         | 0.167         |
| Salpidae             | 0.297         | 0.383         | 5.386         | 0.986         | 3.921         | 0.688         | 0.425         | 0.331         | 0.239         | 0.723         | 0.000         | 0.000           | 0.112         | 0.206         | 0.125         |
| Polychaeta larvae    | 0.000         | 0.000         | 0.032         | 0.000         | 0.000         | 0.030         | 0.000         | 0.000         | 0.000         | 0.000         | 0.093         | 0.000           | 0.056         | 0.232         | 0.021         |
| Cirripedia larvae    | 0.269         | 0.848         | 1.616         | 2.201         | 2.331         | 0.568         | 1.310         | 0.166         | 1.983         | 1.880         | 0.000         | 0.000           | 0.504         | 0.180         | 0.021         |
| Stomatopoda larvae   | 0.038         | 0.109         | 0.095         | 0.066         | 0.106         | 0.150         | 0.124         | 0.000         | 0.034         | 0.120         | 0.000         | 0.000           | 0.000         | 0.000         | 0.000         |
| Echinodermata larvae | 0.010         | 0.000         | 0.000         | 0.000         | 0.000         | 0.030         | 0.000         | 0.000         | 0.034         | 0.000         | 0.000         | 0.000           | 0.000         | 0.000         | 0.000         |
| Invertebrate larvae  | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000           | 0.000         | 0.000         | 0.000         |
| Pisces larvae        | 0.108         | 0.152         | 0.170         | 0.115         | 0.409         | 0.280         | 0.465         | 0.246         | 0.094         | 0.217         | 0.333         | 0.000           | 0.673         | 0.721         | 0.198         |
| Pisces eggs          | 0.300         | 0.234         | 1.481         | 0.943         | 0.237         | 0.064         | 0.157         | 0.043         | 0.051         | 0.337         | 0.213         | 0.000           | 0.616         | 0.052         | 0.313         |
| <b>Total</b>         | <b>13.050</b> | <b>28.557</b> | <b>74.238</b> | <b>49.947</b> | <b>98.447</b> | <b>26.452</b> | <b>18.710</b> | <b>35.238</b> | <b>38.915</b> | <b>33.922</b> | <b>30.630</b> | <b>1557.053</b> | <b>68.483</b> | <b>38.288</b> | <b>26.854</b> |

| Taxa                 | 120.80 | 123.42  | 123.45  | 127.35  | 127.40 | 127.60 | 130.45 | 130.50 | 133.25  | 133.30  | 133.50 | 133.55 | 133.60 | 137.23  | 137.45 |
|----------------------|--------|---------|---------|---------|--------|--------|--------|--------|---------|---------|--------|--------|--------|---------|--------|
| Medusae              | 0.031  | 0.000   | 0.031   | 0.159   | 0.000  | 0.014  | 0.000  | 0.047  | 0.000   | 0.000   | 0.147  | 0.000  | 0.000  | 0.000   | 0.000  |
| Siphonophora         | 0.215  | 0.078   | 0.093   | 0.239   | 0.102  | 0.267  | 0.313  | 0.364  | 0.087   | 0.140   | 0.818  | 0.801  | 0.372  | 4.727   | 0.465  |
| Ctenophora           | 0.000  | 0.000   | 0.000   | 1.592   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.016  | 0.052  | 0.070  | 0.000   | 0.000  |
| Pteropoda            | 0.215  | 0.155   | 0.031   | 0.080   | 0.076  | 0.254  | 0.605  | 1.072  | 0.348   | 0.084   | 0.198  | 0.296  | 0.165  | 0.000   | 0.227  |
| Heteropoda           | 0.046  | 0.000   | 0.031   | 0.000   | 0.025  | 0.028  | 0.241  | 0.164  | 0.000   | 0.028   | 0.000  | 0.129  | 0.139  | 0.073   | 0.045  |
| Cephalopoda          | 0.000  | 0.002   | 0.101   | 0.000   | 0.000  | 0.000  | 0.000  | 0.001  | 0.043   | 0.028   | 0.000  | 0.000  | 0.001  | 0.000   | 0.011  |
| Polychaeta           | 0.107  | 0.078   | 0.000   | 0.159   | 0.000  | 0.140  | 0.096  | 0.176  | 0.000   | 0.028   | 0.065  | 0.181  | 0.046  | 0.000   | 0.034  |
| Cladocera            | 0.015  | 0.026   | 0.155   | 0.080   | 0.025  | 0.000  | 0.000  | 0.023  | 0.000   | 0.000   | 0.000  | 0.052  | 0.023  | 0.000   | 0.011  |
| Ostracoda            | 0.829  | 0.853   | 0.868   | 0.557   | 1.274  | 0.954  | 1.904  | 0.516  | 0.043   | 0.140   | 0.802  | 1.060  | 0.395  | 0.145   | 0.623  |
| Copepoda             | 17.919 | 119.418 | 78.047  | 154.905 | 24.561 | 7.944  | 25.398 | 11.437 | 704.348 | 102.175 | 9.374  | 49.525 | 78.421 | 218.182 | 7.966  |
| Amphipoda            | 0.322  | 0.155   | 0.155   | 0.398   | 0.510  | 0.337  | 0.434  | 0.457  | 0.913   | 0.140   | 0.049  | 0.181  | 0.186  | 0.145   | 0.045  |
| Mysidacea            | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  |
| Euphausiacea         | 2.165  | 3.877   | 13.085  | 31.761  | 16.561 | 5.011  | 6.289  | 2.299  | 3.913   | 17.768  | 2.732  | 5.195  | 6.572  | 11.273  | 2.108  |
| Decapoda             | 0.046  | 0.129   | 0.434   | 3.423   | 0.524  | 0.239  | 0.509  | 0.260  | 27.957  | 0.814   | 0.117  | 0.651  | 0.141  | 4.582   | 0.093  |
| Chaetognatha         | 1.474  | 0.517   | 0.465   | 0.159   | 0.484  | 2.526  | 1.422  | 2.804  | 2.304   | 1.516   | 6.511  | 4.291  | 2.578  | 0.655   | 4.805  |
| Appendicularia       | 2.042  | 4.368   | 7.225   | 6.846   | 1.045  | 0.126  | 0.410  | 0.117  | 0.000   | 0.000   | 1.178  | 1.809  | 0.348  | 113.018 | 0.340  |
| Doliolidae           | 0.215  | 0.000   | 0.000   | 1.274   | 0.025  | 0.042  | 0.048  | 0.704  | 0.000   | 0.000   | 0.965  | 0.439  | 0.070  | 0.582   | 0.204  |
| Salpidae             | 0.046  | 0.000   | 0.000   | 0.239   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  |
| Polychaeta larvae    | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.048  | 0.000  | 0.000   | 0.000   | 0.000  | 0.233  | 0.070  | 0.000   | 0.057  |
| Cirripedia larvae    | 0.061  | 0.026   | 0.000   | 0.000   | 0.000  | 0.070  | 0.145  | 0.059  | 0.000   | 0.000   | 0.000  | 0.078  | 0.023  | 0.000   | 0.000  |
| Stomatopoda larvae   | 0.000  | 0.000   | 0.000   | 0.080   | 0.280  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  |
| Echinodermata larvae | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  |
| Invertebrate larvae  | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   | 0.000   | 0.376  | 0.000  | 0.046  | 0.000   | 0.000  |
| Pisces larvae        | 0.169  | 0.026   | 0.031   | 0.318   | 0.331  | 0.435  | 0.602  | 0.551  | 0.043   | 0.112   | 0.344  | 0.414  | 0.209  | 0.000   | 0.295  |
| Pisces eggs          | 0.230  | 0.103   | 0.372   | 1.114   | 0.178  | 0.351  | 0.771  | 0.270  | 0.043   | 0.000   | 0.376  | 0.258  | 0.790  | 0.145   | 0.238  |
| Total                | 25.536 | 129.499 | 100.837 | 201.154 | 45.798 | 18.035 | 37.979 | 19.497 | 739.565 | 122.667 | 22.824 | 64.186 | 89.871 | 348.727 | 16.785 |

| <b>Taxa</b>          | <b>137.50</b> | <b>137.55</b> |
|----------------------|---------------|---------------|
| Medusae              | 0.060         | 0.057         |
| Siphonophora         | 0.253         | 0.824         |
| Ctenophora           | 0.000         | 0.000         |
| Pteropoda            | 0.012         | 0.142         |
| Heteropoda           | 0.012         | 0.014         |
| Cephalopoda          | 0.000         | 0.000         |
| Polychaeta           | 0.048         | 0.028         |
| Cladocera            | 0.012         | 0.171         |
| Ostracoda            | 0.168         | 0.980         |
| Copepoda             | 7.182         | 7.304         |
| Amphipoda            | 0.012         | 0.142         |
| Mysidacea            | 0.000         | 0.000         |
| Euphausiacea         | 1.588         | 1.321         |
| Decapoda             | 0.050         | 0.442         |
| Chaetognatha         | 5.654         | 1.080         |
| Appendicularia       | 0.854         | 0.469         |
| Doliolidae           | 0.313         | 0.071         |
| Salpidae             | 0.024         | 0.000         |
| Polychaeta larvae    | 0.012         | 0.028         |
| Cirripedia larvae    | 0.000         | 0.000         |
| Stomatopoda larvae   | 0.000         | 0.000         |
| Echinodermata larvae | 0.000         | 0.000         |
| Invertebrate larvae  | 0.000         | 0.000         |
| Pisces larvae        | 0.241         | 0.000         |
| Pisces eggs          | 0.722         | 0.156         |
| Total                | 16.832        | 12.165        |

**APÉNDICE II.....continuación**  
**APPENDIX II.....continuation**

**Tabla 8. IMECOCAL 0407**

| <b>Taxa</b>         | <b>100.35</b> | <b>100.40</b> | <b>100.60</b> | <b>103.40</b> | <b>103.45</b> | <b>103.60</b> | <b>107.40</b> | <b>107.45</b> | <b>110.35</b> | <b>110.55</b> | <b>110.60</b> | <b>113.30</b>  | <b>113.50</b> | <b>113.55</b> | <b>117.45</b> |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|---------------|---------------|---------------|
| Medusae             | 0.079         | 0.027         | 0.759         | 0.823         | 1.457         | 1.025         | 0.047         | 1.589         | 0.299         | 0.992         | 1.922         | 0.000          | 1.345         | 0.242         | 0.405         |
| Siphonophora        | 2.282         | 1.245         | 7.007         | 7.717         | 10.361        | 4.463         | 9.284         | 15.458        | 1.730         | 10.336        | 8.260         | 0.000          | 3.345         | 4.752         | 2.646         |
| Ctenophora          | 0.026         | 0.003         | 0.000         | 0.000         | 0.000         | 0.000         | 0.006         | 0.000         | 0.004         | 0.000         | 0.000         | 0.000          | 0.000         | 0.000         | 0.004         |
| Pteropoda           | 0.684         | 0.514         | 0.876         | 1.494         | 2.698         | 0.397         | 3.158         | 5.709         | 0.832         | 2.398         | 1.818         | 0.000          | 1.891         | 0.617         | 0.840         |
| Heteropoda          | 0.000         | 0.487         | 0.350         | 0.463         | 0.702         | 0.165         | 0.566         | 1.300         | 0.299         | 0.248         | 2.338         | 0.000          | 0.327         | 0.349         | 0.126         |
| Cephalopoda         | 0.000         | 0.000         | 0.000         | 0.000         | 0.054         | 0.000         | 0.000         | 0.144         | 0.002         | 0.083         | 0.000         | 0.000          | 0.000         | 0.000         | 0.000         |
| Polychaeta          | 0.026         | 0.054         | 0.000         | 0.051         | 0.054         | 0.198         | 0.236         | 0.939         | 0.033         | 0.331         | 0.208         | 0.000          | 0.364         | 0.295         | 0.249         |
| Cladocera           | 0.000         | 0.027         | 0.000         | 0.000         | 0.000         | 0.033         | 0.000         | 0.000         | 0.266         | 0.000         | 0.000         | 0.000          | 0.073         | 0.027         | 0.000         |
| Ostracoda           | 2.439         | 3.276         | 2.219         | 3.807         | 3.885         | 2.744         | 7.116         | 9.607         | 1.397         | 5.788         | 8.052         | 0.000          | 4.255         | 3.973         | 3.518         |
| Copepoda            | 19.121        | 21.008        | 56.584        | 26.495        | 26.118        | 10.248        | 64.189        | 47.169        | 8.383         | 18.770        | 34.494        | 886.154        | 13.382        | 14.846        | 18.802        |
| Amphipoda           | 0.630         | 0.785         | 1.693         | 3.138         | 2.644         | 0.331         | 2.404         | 4.334         | 1.231         | 2.563         | 1.922         | 0.000          | 1.709         | 1.557         | 1.432         |
| Euphausiacea        | 5.220         | 7.662         | 12.146        | 5.505         | 8.472         | 5.719         | 9.850         | 14.302        | 4.657         | 10.915        | 15.065        | 245.169        | 5.855         | 2.899         | 4.732         |
| Decapoda            | 0.052         | 0.030         | 0.000         | 0.310         | 0.594         | 0.264         | 0.141         | 0.652         | 0.033         | 0.165         | 0.260         | 0.923          | 0.036         | 0.000         | 0.062         |
| Chaetognatha        | 2.911         | 0.541         | 7.825         | 3.344         | 6.368         | 4.298         | 1.037         | 1.156         | 3.160         | 4.382         | 6.390         | 0.000          | 4.873         | 1.960         | 0.965         |
| Appendicularia      | 0.682         | 0.054         | 10.978        | 7.820         | 8.850         | 5.223         | 2.356         | 3.178         | 4.690         | 10.584        | 9.091         | 3.938          | 2.145         | 1.450         | 0.280         |
| Doliolidae          | 0.026         | 0.000         | 4.204         | 2.109         | 3.292         | 5.488         | 0.047         | 0.433         | 0.200         | 1.406         | 1.714         | 0.000          | 0.255         | 0.295         | 0.093         |
| Salpidae            | 0.000         | 0.027         | 0.004         | 0.360         | 0.000         | 0.099         | 0.189         | 0.072         | 0.002         | 0.165         | 0.104         | 0.000          | 0.000         | 0.000         | 0.031         |
| Polychaeta larvae   | 0.026         | 0.027         | 0.000         | 0.000         | 0.162         | 0.000         | 0.000         | 0.072         | 0.033         | 0.165         | 0.156         | 0.000          | 0.109         | 0.000         | 0.125         |
| Cirripedia larvae   | 0.157         | 0.054         | 0.234         | 0.257         | 0.162         | 0.231         | 0.000         | 2.023         | 0.200         | 0.413         | 0.779         | 0.000          | 0.327         | 0.107         | 0.093         |
| Stomatopoda larvae  | 0.026         | 0.027         | 0.000         | 0.000         | 0.000         | 0.008         | 0.094         | 0.000         | 0.067         | 0.000         | 0.000         | 0.000          | 0.000         | 0.000         | 0.008         |
| Echinodermata larva | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.248         | 0.000         | 0.000          | 0.036         | 0.000         | 0.000         |
| Invertebrate larvae | 0.026         | 0.108         | 0.000         | 0.669         | 0.000         | 0.000         | 0.000         | 0.000         | 0.067         | 0.000         | 0.156         | 0.000          | 0.000         | 0.000         | 0.000         |
| Pisces larvae       | 0.131         | 0.054         | 0.117         | 0.514         | 1.079         | 1.818         | 0.518         | 0.939         | 0.399         | 0.496         | 0.987         | 0.000          | 0.873         | 0.268         | 0.187         |
| Pisces eggs         | 0.000         | 0.000         | 3.328         | 0.463         | 0.108         | 0.496         | 0.000         | 0.217         | 0.067         | 0.083         | 0.416         | 0.000          | 0.000         | 0.027         | 0.000         |
| <b>Total</b>        | <b>31.449</b> | <b>33.682</b> | <b>99.332</b> | <b>54.793</b> | <b>61.734</b> | <b>37.000</b> | <b>87.941</b> | <b>84.156</b> | <b>24.850</b> | <b>56.145</b> | <b>79.584</b> | <b>1136.18</b> | <b>33.927</b> | <b>27.409</b> | <b>30.327</b> |

| Taxa                | 117.50 | 117.70  | 117.75 | 120.30  | 120.35  | 120.40  | 120.60 | 120.65 | 123.42  | 123.45 | 127.45 | 127.50 | 130.30  | 130.50 | 130.55 |
|---------------------|--------|---------|--------|---------|---------|---------|--------|--------|---------|--------|--------|--------|---------|--------|--------|
| Medusae             | 2.708  | 4.115   | 1.099  | 0.893   | 0.906   | 2.306   | 0.492  | 0.772  | 1.106   | 0.789  | 0.500  | 0.675  | 0.000   | 0.584  | 1.048  |
| Siphonophora        | 7.341  | 16.893  | 7.952  | 7.293   | 6.943   | 5.766   | 8.689  | 4.631  | 5.021   | 6.436  | 1.962  | 6.909  | 3.303   | 4.146  | 5.100  |
| Ctenophora          | 0.000  | 0.000   | 0.008  | 0.000   | 0.038   | 0.000   | 0.033  | 0.007  | 0.011   | 0.008  | 0.005  | 0.006  | 0.206   | 0.007  | 0.000  |
| Pteropoda           | 2.209  | 1.841   | 4.978  | 0.153   | 8.453   | 3.748   | 6.197  | 13.358 | 3.319   | 3.097  | 5.462  | 9.143  | 0.000   | 2.511  | 6.148  |
| Heteropoda          | 1.568  | 2.382   | 1.164  | 0.000   | 6.340   | 2.018   | 0.328  | 0.534  | 0.936   | 0.731  | 0.115  | 0.416  | 0.000   | 0.350  | 0.629  |
| Cephalopoda         | 0.000  | 0.000   | 0.000  | 0.000   | 0.000   | 0.288   | 0.000  | 0.059  | 0.000   | 0.000  | 0.038  | 0.104  | 0.013   | 0.000  | 0.000  |
| Polychaeta          | 0.428  | 0.866   | 0.259  | 0.000   | 0.302   | 0.000   | 0.197  | 0.416  | 0.170   | 0.243  | 0.038  | 0.156  | 0.000   | 0.058  | 0.070  |
| Cladocera           | 0.000  | 0.000   | 0.000  | 0.000   | 8.453   | 0.000   | 0.033  | 0.178  | 0.596   | 0.425  | 0.115  | 0.052  | 0.000   | 0.117  | 0.000  |
| Ostracoda           | 5.274  | 9.854   | 6.853  | 0.000   | 0.302   | 0.288   | 5.836  | 11.696 | 6.468   | 6.558  | 4.500  | 8.000  | 0.000   | 5.664  | 6.148  |
| Copepoda            | 14.610 | 60.102  | 31.677 | 398.884 | 381.283 | 616.937 | 38.656 | 43.518 | 78.298  | 36.493 | 14.308 | 28.104 | 2345.29 | 10.569 | 12.6   |
| Amphipoda           | 1.497  | 6.714   | 1.487  | 1.042   | 2.113   | 0.865   | 1.082  | 1.009  | 2.809   | 4.615  | 0.962  | 0.883  | 0.000   | 0.642  | 0.419  |
| Euphausiacea        | 6.842  | 17.110  | 12.929 | 22.772  | 223.396 | 226.883 | 6.623  | 9.440  | 25.362  | 14.148 | 3.192  | 10.701 | 586.323 | 5.197  | 6.079  |
| Decapoda            | 0.430  | 0.758   | 0.129  | 0.744   | 2.113   | 3.459   | 0.426  | 0.712  | 0.778   | 0.425  | 0.154  | 0.623  | 0.000   | 0.117  | 0.140  |
| Chaetognatha        | 8.125  | 9.854   | 8.081  | 14.735  | 2.717   | 8.072   | 4.393  | 7.481  | 5.702   | 5.829  | 4.077  | 5.766  | 3.303   | 19.562 | 17.886 |
| Appendicularia      | 12.543 | 7.147   | 8.210  | 0.000   | 6.038   | 2.306   | 2.295  | 1.781  | 4.255   | 2.065  | 0.769  | 1.662  | 0.000   | 1.752  | 1.607  |
| Doliolidae          | 0.784  | 0.325   | 0.453  | 0.000   | 2.113   | 0.000   | 5.508  | 5.640  | 1.532   | 1.275  | 4.038  | 6.286  | 0.000   | 2.686  | 1.188  |
| Salpidae            | 0.570  | 0.866   | 0.000  | 0.000   | 0.000   | 0.000   | 0.525  | 1.425  | 0.000   | 0.000  | 0.115  | 0.312  | 0.000   | 0.701  | 0.559  |
| Polychaeta larvae   | 0.000  | 0.000   | 0.065  | 0.000   | 0.000   | 0.000   | 0.000  | 0.297  | 0.426   | 0.850  | 0.000  | 0.208  | 0.000   | 0.058  | 0.000  |
| Cirripedia larvae   | 0.000  | 0.541   | 0.905  | 0.000   | 0.000   | 0.000   | 0.098  | 0.416  | 1.532   | 0.364  | 0.000  | 0.052  | 0.000   | 0.000  | 0.000  |
| Stomatopoda larvae  | 0.000  | 0.108   | 0.000  | 0.000   | 0.000   | 0.577   | 0.000  | 0.000  | 0.170   | 0.061  | 0.000  | 0.000  | 0.000   | 0.000  | 0.002  |
| Echinodermata larva | 0.000  | 0.000   | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.000   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  | 0.000  |
| Invertebrate larvae | 0.000  | 0.108   | 0.000  | 0.000   | 0.000   | 0.000   | 0.000  | 0.000  | 0.170   | 0.000  | 0.000  | 0.000  | 0.000   | 0.000  | 0.070  |
| Pisces larvae       | 0.713  | 0.650   | 1.681  | 0.149   | 2.717   | 3.748   | 2.885  | 4.631  | 2.213   | 1.093  | 1.654  | 0.987  | 0.000   | 2.686  | 3.843  |
| Pisces eggs         | 0.285  | 1.949   | 0.776  | 0.149   | 1.509   | 0.577   | 0.066  | 0.237  | 0.511   | 0.243  | 1.769  | 0.831  | 0.000   | 1.109  | 0.070  |
| Total               | 51.673 | 116.088 | 73.244 | 438.474 | 632.755 | 863.712 | 68.426 | 88.460 | 130.820 | 74.444 | 35.654 | 64.468 | 2934.92 | 50.861 | 50.6   |

| <b>Taxa</b>         | <b>133.25</b> | <b>133.50</b> | <b>133.55</b> | <b>137.45</b> | <b>137.50</b> | <b>140.30</b> |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Medusae             | 4.535         | 0.290         | 0.458         | 0.336         | 5.130         | 4.816         |
| Siphonophora        | 34.772        | 4.812         | 5.768         | 5.147         | 10.261        | 4.660         |
| Ctenophora          | 0.063         | 0.007         | 0.006         | 0.003         | 0.008         | 0.019         |
| Pteropoda           | 2.016         | 9.681         | 3.433         | 1.035         | 1.667         | 0.932         |
| Heteropoda          | 0.504         | 0.174         | 0.366         | 0.056         | 4.104         | 0.155         |
| Cephalopoda         | 0.016         | 0.000         | 0.046         | 0.028         | 0.064         | 0.621         |
| Polychaeta          | 0.504         | 0.174         | 0.092         | 0.140         | 0.257         | 0.000         |
| Cladocera           | 0.000         | 0.000         | 0.000         | 0.000         | 0.192         | 0.000         |
| Ostracoda           | 1.512         | 4.522         | 4.074         | 2.210         | 3.719         | 0.311         |
| Copepoda            | 1562.20       | 13.043        | 25.637        | 12.643        | 19.559        | 186.408       |
| Amphipoda           | 2.016         | 0.870         | 0.870         | 0.783         | 0.577         | 0.000         |
| Euphausiacea        | 103.307       | 4.696         | 3.525         | 4.224         | 5.387         | 54.990        |
| Decapoda            | 0.000         | 0.000         | 0.183         | 0.056         | 0.577         | 2.330         |
| Chaetognatha        | 3.024         | 7.710         | 5.265         | 5.538         | 7.952         | 9.320         |
| Appendicularia      | 23.685        | 1.623         | 0.961         | 2.098         | 2.180         | 9.165         |
| Doliolidae          | 1.008         | 0.986         | 0.641         | 0.392         | 2.822         | 0.155         |
| Salpidae            | 2.016         | 0.290         | 0.046         | 0.000         | 0.321         | 0.155         |
| Polychaeta larvae   | 1.008         | 0.000         | 0.275         | 0.000         | 0.000         | 0.000         |
| Cirripedia larvae   | 0.000         | 0.000         | 0.000         | 0.000         | 0.064         | 0.000         |
| Stomatopoda larvae  | 0.071         | 0.000         | 0.026         | 0.017         | 0.000         | 0.000         |
| Echinodermata larva | 0.000         | 0.000         | 0.000         | 0.000         | 0.064         | 0.000         |
| Invertebrate larvae | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.155         |
| Pisces larvae       | 0.504         | 1.681         | 1.740         | 0.755         | 0.128         | 0.000         |
| Pisces eggs         | 0.504         | 1.217         | 0.046         | 0.140         | 1.731         | 0.311         |
| Total               | 1700.86       | 36.638        | 43.288        | 28.857        | 45.275        | 263.301       |



**APÉNDICE II.....continuación**  
**APPENDIX II.....continuation**

**Tabla 9. IMECOCAL 0410**

| <b>Taxa</b>         | <b>100.32</b> | <b>100.35</b> | <b>100.40</b> | <b>100.55</b> | <b>100.60</b> | <b>103.40</b> | <b>103.45</b> | <b>103.50</b> | <b>107.32</b> | <b>107.33</b> | <b>107.35</b> | <b>107.55</b> | <b>107.60</b> | <b>110.37</b> | <b>110.40</b> |
|---------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Medusae             | 0.026         | 0.028         | 0.208         | 0.286         | 0.214         | 1.313         | 0.549         | 0.265         | 2.438         | 3.374         | 1.712         | 0.147         | 0.000         | 2.875         | 0.323         |
| Siphonophora        | 1.508         | 0.613         | 1.413         | 1.613         | 3.095         | 3.721         | 2.469         | 2.683         | 3.962         | 4.105         | 1.451         | 1.588         | 3.559         | 2.417         | 1.613         |
| Ctenophora          | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.149         | 0.000         | 0.000         | 0.125         | 0.032         |
| Pteropoda           | 0.026         | 1.059         | 0.249         | 0.182         | 0.872         | 0.378         | 0.427         | 0.629         | 0.549         | 0.394         | 0.447         | 0.235         | 0.206         | 0.396         | 0.484         |
| Heteropoda          | 0.026         | 0.139         | 0.125         | 0.026         | 0.000         | 0.119         | 0.122         | 0.265         | 0.366         | 0.056         | 0.521         | 0.471         | 0.000         | 0.104         | 0.097         |
| Cephalopoda         | 0.000         | 0.000         | 0.000         | 0.000         | 0.002         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.032         |
| Polychaeta          | 0.026         | 0.279         | 0.000         | 0.078         | 0.099         | 0.199         | 0.122         | 0.232         | 0.061         | 0.056         | 0.186         | 0.147         | 0.265         | 0.250         | 0.000         |
| Cladocera           | 0.026         | 0.000         | 0.000         | 0.000         | 0.000         | 0.040         | 0.000         | 0.166         | 0.610         | 0.112         | 13.209        | 0.265         | 0.088         | 0.063         | 0.097         |
| Ostracoda           | 1.252         | 1.645         | 1.912         | 0.937         | 1.695         | 1.791         | 1.158         | 1.557         | 0.975         | 0.844         | 1.637         | 1.971         | 3.882         | 4.104         | 2.097         |
| Copepoda            | 19.450        | 19.066        | 24.852        | 13.789        | 14.140        | 15.025        | 13.349        | 14.542        | 43.215        | 30.032        | 24.484        | 14.735        | 22.706        | 10.208        | 17.742        |
| Amphipoda           | 0.000         | 0.362         | 0.249         | 0.780         | 0.280         | 0.438         | 0.884         | 1.159         | 0.427         | 0.450         | 0.930         | 1.294         | 0.529         | 0.521         | 0.613         |
| Mysidacea           | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Euphausiacea        | 0.843         | 0.725         | 1.330         | 0.963         | 1.053         | 2.109         | 3.109         | 5.333         | 4.267         | 5.343         | 5.619         | 2.588         | 2.118         | 3.354         | 4.032         |
| Decapoda            | 0.128         | 0.141         | 0.042         | 0.026         | 0.049         | 0.219         | 0.183         | 0.101         | 1.219         | 0.450         | 0.447         | 0.147         | 0.176         | 0.167         | 0.097         |
| Chaetognatha        | 4.856         | 3.735         | 5.195         | 4.033         | 2.140         | 2.786         | 1.097         | 2.319         | 7.070         | 19.459        | 2.493         | 1.618         | 6.676         | 1.500         | 4.097         |
| Appendicularia      | 0.204         | 1.394         | 2.036         | 1.223         | 2.255         | 6.169         | 2.194         | 2.749         | 5.547         | 5.624         | 3.460         | 4.382         | 6.000         | 3.479         | 3.645         |
| Doliolida           | 0.000         | 0.000         | 0.208         | 0.026         | 0.115         | 0.080         | 0.152         | 0.133         | 0.366         | 0.225         | 1.079         | 0.324         | 0.235         | 0.104         | 0.290         |
| Salpida             | 0.000         | 0.056         | 0.166         | 0.026         | 0.148         | 0.060         | 0.579         | 1.557         | 0.000         | 0.000         | 0.074         | 0.088         | 0.294         | 0.063         | 0.097         |
| Polychaeta larvae   | 0.000         | 0.000         | 0.000         | 0.000         | 0.016         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         |
| Cirripedia larvae   | 0.000         | 0.084         | 0.083         | 0.052         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.037         | 0.000         | 0.029         | 0.000         | 0.000         |
| Stomatopoda larvae  | 0.000         | 0.028         | 0.083         | 0.026         | 0.000         | 0.000         | 0.030         | 0.066         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.097         |
| Echinodermata larva | 0.051         | 0.028         | 0.083         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.112         | 0.186         | 0.000         | 0.000         | 0.000         | 0.000         |
| Pisces larvae       | 0.000         | 0.028         | 0.125         | 0.078         | 0.165         | 0.000         | 0.030         | 0.033         | 0.305         | 0.394         | 0.074         | 0.059         | 0.176         | 0.104         | 0.000         |
| Pisces eggs         | 0.077         | 0.028         | 0.125         | 0.546         | 0.148         | 0.100         | 0.000         | 0.000         | 0.000         | 0.056         | 0.112         | 0.000         | 0.147         | 0.021         | 0.000         |
| <b>Total</b>        | <b>26.888</b> | <b>27.319</b> | <b>36.488</b> | <b>22.504</b> | <b>22.206</b> | <b>28.816</b> | <b>22.766</b> | <b>29.716</b> | <b>64.000</b> | <b>63.100</b> | <b>53.842</b> | <b>27.471</b> | <b>43.059</b> | <b>23.688</b> | <b>32.903</b> |

| Taxa                | 110.45 | 113.34 | 113.35 | 113.40 | 113.45 | 113.60 | 117.30 | 117.35 | 117.40 | 117.43 | 117.55 | 117.60 | 117.65 | 120.35 | 120.39 |
|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Medusae             | 1.110  | 0.031  | 0.232  | 0.186  | 0.319  | 0.034  | 0.286  | 0.123  | 0.281  | 0.198  | 0.427  | 0.031  | 0.131  | 0.048  | 0.229  |
| Siphonophora        | 2.678  | 4.531  | 8.522  | 2.569  | 2.301  | 2.627  | 0.408  | 0.615  | 2.116  | 1.649  | 2.198  | 0.542  | 1.309  | 1.048  | 1.343  |
| Ctenophora          | 0.000  | 0.000  | 0.000  | 0.000  | 0.035  | 0.000  | 0.000  | 0.062  | 0.000  | 0.010  | 0.000  | 0.000  | 0.033  | 0.000  | 0.000  |
| Pteropoda           | 0.555  | 0.500  | 0.232  | 0.279  | 0.354  | 0.674  | 2.204  | 2.523  | 0.099  | 0.138  | 2.626  | 0.650  | 0.524  | 1.857  | 4.229  |
| Heteropoda          | 0.229  | 0.000  | 0.000  | 0.155  | 0.248  | 0.135  | 0.204  | 0.062  | 0.083  | 0.079  | 0.000  | 0.031  | 0.164  | 0.381  | 0.457  |
| Cephalopoda         | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.010  | 0.002  | 0.015  | 0.000  | 0.238  | 0.000  |
| Polychaeta          | 0.196  | 0.000  | 0.000  | 0.124  | 0.177  | 0.168  | 0.041  | 0.308  | 0.364  | 0.217  | 0.244  | 0.217  | 0.327  | 0.000  | 0.086  |
| Cladocera           | 0.131  | 0.000  | 0.000  | 0.031  | 0.106  | 0.000  | 0.041  | 0.000  | 0.000  | 0.128  | 0.244  | 0.000  | 0.131  | 0.000  | 0.000  |
| Ostracoda           | 2.971  | 0.375  | 0.203  | 2.971  | 1.876  | 2.392  | 0.082  | 0.585  | 1.818  | 0.326  | 4.702  | 2.491  | 1.734  | 0.000  | 0.029  |
| Copepoda            | 18.776 | 10.719 | 11.217 | 14.019 | 16.354 | 13.272 | 40.816 | 13.908 | 13.140 | 4.919  | 21.863 | 18.631 | 20.875 | 40.048 | 8.486  |
| Amphipoda           | 1.045  | 0.031  | 0.000  | 0.371  | 0.602  | 0.371  | 0.082  | 0.369  | 0.959  | 0.523  | 0.550  | 0.294  | 0.425  | 0.048  | 0.114  |
| Mysidacea           | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.571  | 0.000  |
| Euphausiacea        | 5.453  | 1.438  | 4.899  | 2.538  | 2.796  | 2.257  | 2.327  | 1.292  | 2.512  | 1.017  | 4.275  | 1.702  | 3.730  | 0.571  | 14.000 |
| Decapoda            | 0.065  | 0.188  | 0.377  | 0.340  | 0.142  | 0.135  | 0.367  | 0.062  | 0.083  | 0.099  | 0.366  | 0.248  | 0.393  | 0.857  | 4.000  |
| Chaetognatha        | 3.494  | 0.844  | 0.348  | 3.188  | 3.858  | 5.996  | 0.204  | 0.215  | 0.645  | 1.284  | 12.519 | 1.749  | 6.249  | 0.381  | 0.429  |
| Appendicularia      | 8.751  | 1.906  | 1.739  | 2.878  | 11.292 | 3.975  | 7.592  | 0.123  | 0.314  | 0.119  | 10.015 | 0.681  | 7.329  | 0.000  | 0.000  |
| Doliolida           | 0.163  | 0.031  | 0.000  | 0.371  | 0.177  | 0.472  | 0.000  | 0.031  | 0.017  | 0.020  | 0.916  | 0.913  | 0.622  | 0.000  | 0.000  |
| Salpida             | 0.196  | 0.875  | 2.029  | 3.311  | 0.779  | 1.114  | 12.041 | 0.954  | 0.050  | 0.069  | 1.405  | 0.573  | 0.196  | 14.571 | 3.829  |
| Polychaeta larvae   | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Cirripedia larvae   | 0.065  | 0.000  | 0.000  | 0.000  | 0.106  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.122  | 0.062  | 0.033  | 0.000  | 0.000  |
| Stomatopoda larvae  | 0.000  | 0.094  | 0.058  | 0.000  | 0.000  | 0.000  | 0.041  | 0.062  | 0.017  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Echinodermata larva | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  |
| Pisces larvae       | 0.229  | 0.000  | 0.116  | 0.124  | 0.389  | 0.269  | 0.082  | 0.031  | 0.033  | 0.059  | 0.427  | 0.557  | 0.098  | 0.762  | 0.657  |
| Pisces eggs         | 0.033  | 0.281  | 0.145  | 0.062  | 0.000  | 0.000  | 0.776  | 0.000  | 0.000  | 0.000  | 0.122  | 0.015  | 0.000  | 2.238  | 1.143  |
| Total               | 41.371 | 16.781 | 21.130 | 30.205 | 38.478 | 30.251 | 64.449 | 17.631 | 19.587 | 8.563  | 57.527 | 27.915 | 41.816 | 60.048 | 32.686 |

| Taxa                | 120.43 | 120.55 | 120.60 | 120.65 | 123.41 | 123.42 | 123.45 | 123.60 | 127.45 | 127.50 | 127.55 | 130.45 | 130.50 | 130.55 | 133.25  |
|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| Medusae             | 0.245  | 0.073  | 0.057  | 0.000  | 0.000  | 0.072  | 0.097  | 0.033  | 0.103  | 0.743  | 0.053  | 0.052  | 0.225  | 0.124  | 0.530   |
| Siphonophora        | 0.282  | 0.364  | 0.212  | 0.119  | 0.922  | 0.614  | 0.901  | 0.049  | 0.650  | 1.487  | 0.632  | 0.174  | 0.242  | 0.680  | 6.718   |
| Ctenophora          | 0.000  | 0.000  | 0.000  | 0.017  | 0.000  | 0.000  | 0.032  | 0.000  | 0.000  | 0.212  | 0.035  | 0.017  | 0.000  | 0.000  | 0.177   |
| Pteropoda           | 0.376  | 0.782  | 0.919  | 0.664  | 1.085  | 0.325  | 0.612  | 0.969  | 0.376  | 0.673  | 1.368  | 0.366  | 1.330  | 1.134  | 3.890   |
| Heteropoda          | 0.019  | 0.000  | 0.042  | 0.153  | 0.217  | 0.144  | 0.483  | 0.066  | 0.632  | 0.462  | 0.158  | 0.061  | 0.173  | 0.289  | 1.768   |
| Cephalopoda         | 0.000  | 0.018  | 0.000  | 0.034  | 0.000  | 0.000  | 0.032  | 0.049  | 0.017  | 0.000  | 0.000  | 0.000  | 0.017  | 0.041  | 0.707   |
| Polychaeta          | 0.075  | 0.018  | 0.042  | 0.034  | 0.434  | 0.144  | 0.258  | 0.148  | 0.120  | 0.248  | 0.088  | 0.087  | 0.121  | 0.371  | 1.061   |
| Cladocera           | 0.038  | 0.218  | 0.014  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.017  | 0.082  | 0.000   |
| Ostracoda           | 0.866  | 2.636  | 4.862  | 2.928  | 2.169  | 0.975  | 0.773  | 1.133  | 0.496  | 0.885  | 1.386  | 1.115  | 1.019  | 1.010  | 0.530   |
| Copepoda            | 7.209  | 12.200 | 17.300 | 17.770 | 45.451 | 20.117 | 20.282 | 10.530 | 13.009 | 15.221 | 15.702 | 8.331  | 10.419 | 11.299 | 59.050  |
| Amphipoda           | 0.282  | 0.309  | 0.269  | 0.647  | 0.814  | 0.361  | 1.416  | 0.329  | 0.410  | 0.106  | 0.772  | 0.322  | 0.518  | 0.701  | 5.304   |
| Mysidacea           | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.016  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   |
| Euphausiacea        | 1.619  | 1.527  | 1.640  | 3.268  | 6.780  | 4.370  | 15.549 | 3.006  | 3.915  | 4.354  | 4.386  | 1.168  | 0.778  | 1.546  | 1.768   |
| Decapoda            | 0.245  | 0.091  | 0.127  | 0.051  | 0.325  | 0.650  | 1.223  | 0.033  | 0.051  | 0.106  | 0.072  | 0.009  | 0.035  | 0.144  | 6.365   |
| Chaetognatha        | 2.033  | 3.545  | 3.449  | 3.166  | 32.488 | 12.208 | 11.235 | 4.205  | 13.060 | 14.832 | 7.474  | 2.466  | 6.186  | 10.289 | 53.746  |
| Appendicularia      | 1.882  | 3.000  | 2.629  | 3.472  | 1.627  | 0.578  | 1.867  | 1.495  | 0.291  | 1.027  | 1.544  | 0.932  | 0.639  | 0.887  | 9.724   |
| Doliolida           | 0.038  | 0.255  | 0.325  | 0.409  | 0.325  | 0.036  | 0.258  | 0.115  | 0.256  | 0.531  | 0.246  | 0.314  | 0.311  | 0.887  | 54.983  |
| Salpida             | 0.019  | 0.527  | 0.763  | 0.272  | 0.000  | 0.000  | 0.032  | 0.066  | 0.017  | 0.106  | 0.105  | 0.044  | 0.035  | 0.021  | 1.061   |
| Polychaeta larvae   | 0.056  | 0.000  | 0.042  | 0.051  | 0.217  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.017  | 0.000  | 0.000   |
| Cirripedia larvae   | 0.038  | 0.018  | 0.028  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.034  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.354   |
| Stomatopoda larvae  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.035  | 0.000  | 0.000  | 0.000  | 0.082  | 0.884   |
| Echinodermata larva | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000  | 0.000   |
| Pisces larvae       | 0.000  | 0.236  | 0.240  | 0.034  | 0.597  | 0.000  | 0.064  | 0.263  | 0.103  | 0.035  | 0.123  | 0.174  | 0.173  | 0.124  | 4.072   |
| Pisces eggs         | 0.056  | 0.073  | 0.057  | 0.034  | 0.000  | 0.036  | 0.000  | 0.016  | 0.000  | 0.000  | 0.000  | 0.017  | 0.000  | 0.041  | 3.182   |
| Total               | 14.381 | 24.636 | 31.746 | 32.102 | 90.793 | 39.332 | 52.700 | 21.207 | 31.641 | 37.239 | 31.809 | 14.893 | 20.147 | 27.113 | 201.022 |

| <b>Taxa</b>         | <b>133.30</b> |
|---------------------|---------------|
| Medusae             | 0.316         |
| Siphonophora        | 1.975         |
| Ctenophora          | 0.000         |
| Pteropoda           | 1.264         |
| Heteropoda          | 0.632         |
| Cephalopoda         | 0.000         |
| Polychaeta          | 0.869         |
| Cladocera           | 0.000         |
| Ostracoda           | 1.343         |
| Copepoda            | 23.704        |
| Amphipoda           | 2.054         |
| Mysidacea           | 0.000         |
| Euphausiacea        | 5.294         |
| Decapoda            | 17.146        |
| Chaetognatha        | 21.096        |
| Appendicularia      | 6.558         |
| Doliolida           | 2.449         |
| Salpida             | 0.711         |
| Polychaeta larvae   | 0.000         |
| Cirripedia larvae   | 0.000         |
| Stomatopoda larvae  | 0.081         |
| Echinodermata larva | 0.000         |
| Pisces larvae       | 5.847         |
| Pisces eggs         | 0.474         |
| Total               | 86.758        |

## **INFORMES TÉCNICOS ANTERIORES SOBRE ZOOPLANKTON** **PREVIOUS TECHNICAL REPORTS ON ZOOPLANKTON**

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| CRUISE                       | REPORT                                                                                                                                                                                                                                                                                                                                   |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9710                         | Jiménez-Pérez L.C., Lavaniegos-Espejo B.E., Baumgartner T. 1998. Biomasa y estructura del zooplancton en aguas de la Corriente de California durante Octubre de 1997. Informe Técnico. Comunicaciones Académicas, Serie Ecología, CICESE, CTECT9801, 32 p.                                                                               |
| 9801                         | Jiménez-Pérez L.C., Lavaniegos-Espejo B.E., Baumgartner T. 1999. Biomasa y estructura del zooplancton de la parte sur de la Corriente de California durante Enero de 1998. Informe Técnico. Comunicaciones Académicas, Serie Ecología, CICESE, CTECT9901, 43 p.                                                                          |
| 9807                         | Jiménez-Pérez L.C., Lavaniegos-Espejo B.E., Baumgartner T. 2000. Biomasa y estructura del zooplancton en la parte sur de la Corriente de California durante Julio de 1998. Informe Técnico. Comunicaciones Académicas, Serie Ecología, CICESE, CTECT200010, 41 p.                                                                        |
| 9810                         | Jiménez-Pérez L.C., Lavaniegos-Espejo B.E., Baumgartner T. 2001. Biomasa y estructura del zooplancton colectado por el crucero IMECOCAL 9809/10 en la parte sur de la Corriente de California. Informe Técnico. Comunicaciones Académicas, Serie Ecología, CICESE, CTECT20011, 39 p.                                                     |
| 9901                         | Jiménez-Pérez L.C., Lavaniegos-Espejo B.E., Baumgartner T. 2001. Biomasa y estructura del zooplancton colectado por el crucero IMECOCAL 9901 en la parte sur de la Corriente de California. Informe Técnico. Comunicaciones Académicas, Serie Ecología, CICESE, CTECT20013, 39 p.                                                        |
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| 9908                         | Hernández-León J.C., Mejía-Acosta S.J., Jiménez-Pérez L.C., Lavaniegos-Espejo B.E. 2002. Biomasa y estructura del zooplancton colectado por el crucero IMECOCAL 9908 en la parte sur de la Corriente de California. Informe Técnico CICESE No. 3771, 38 p.                                                                               |
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| 0001<br>0004<br>0007<br>0010 | Lavaniegos B.E., Hernández-León J.C., Mejía-Acosta S.J., Jiménez-Pérez L.C. 2004. Zooplankton biomass and structure off the western coast of Baja California during 2000 (IMECOCAL cruises 0001, 0004, 0007, 0010). Informe Técnico. Comunicaciones Académicas, Serie Oceanografía Biológica, CICESE No. 21601, 61 p.                    |
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