

## Subtidal benthic polychaetes (Annelida) of the Gulf of Nicoya, Costa Rica

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**Abstract:** One hundred and forty six species of polychaetes belonging to 35 families were identified from material collected from 25 subtidal sample sites in the Gulf of Nicoya. One hundred and twenty five of these species were present in multireplicate collections taken seasonally at four stations with contrasting sedimentary environments. The three most commonly collected species at these four stations were the capitellids *Mediomastus californiensis?* and *Notomastus luridus*, and the spionid *Prionospio multibranchiata*. These results indicate that the polychaete fauna of the Gulf of Nicoya has not been adequately characterized and may be of greater species richness than previously reported.

**Key words:** Polychaeta, Gulf of Nicoya, Costa Rica, Eastern Pacific Ocean, feeding type, seasonal, grab, estuary, benthos.

A great deal of scientific research on the Gulf of Nicoya marine ecosystem has been conducted over the two decades following a cooperative research effort between the University of Costa Rica CIMAR and the University of Delaware (USA) (See review by Vargas, 1995). Much remains to be learned, however, and the task is made more formidable by the taxonomic challenges of the Nicoyan biota. The most ambitious effort to characterize the marine fauna of the Gulf of Nicoya involved a series of trawls and bottom grabs conducted between 1977 and 1981 as part of the Costa Rica-Delaware collaboration. The results of this work have provided a good foundation of taxonomic knowledge for any further ecological study (Epifanio and Dittel 1982, DeVries *et al.* 1983, Voorhis *et al.* 1983, Bartels *et al.* 1984, Maurer *et al.* 1984, Maurer and Vargas 1984, Vargas *et al.* 1985).

A major component of this research effort was the collection of a series of bottom sediment samples as part of a Gulf-wide benthic survey and seasonal secondary-productivity study. The large number of marine invertebrates

identified from these bottom samples has fostered the further expansion of our knowledge of benthic ecology in the Gulf of Nicoya (Maurer and Vargas 1984, Maurer *et al.* 1984, Vargas *et al.* 1985, Dittel *et al.* 1985, De la Cruz and Vargas 1986, 1987; Vargas 1987, 1988a, 1988b).

The polychaetes are of major numerical importance in the benthic fauna collected in the Gulf of Nicoya. Maurer and Vargas (1984) reported that the polychaetes comprised 58.6% of the species and 68.1% of the individuals identified in the Gulf survey and seasonal samplings. Maurer *et al.* (1988) presented the first list of subtidal polychaetes from the Gulf of Nicoya based upon precursory identification of this material.

As part of an ongoing project to characterize the polychaete fauna of the Gulf of Nicoya, much of the polychaete material, now housed in the Museum of Comparative Zoology, Cambridge Massachusetts (USA) and the Museo de Zoología, Universidad de Costa Rica (Costa Rica), has been reexamined. This article presents an updated list of subtidal polychaetes collected

from the Gulf of Nicoya along with notes concerning those species collected at the four seasonal sampling stations.

#### MATERIAL AND METHODS

The polychaetes were identified from material collected at 25 stations (Fig. 1) established in the mid to lower Gulf of Nicoya as

part of a benthic survey (Maurer and Vargas 1984). More precise station location data, bottom sediment characteristics and sampling and handling procedures may be found in Maurer and Vargas (1984) and Maurer *et al.* (1988). Voucher specimens of all identified species are deposited either at the Museum of Comparative Zoology, Cambridge, Massachusetts (USA) or the Museo de Zoología, San Pedro, San José (Costa Rica).

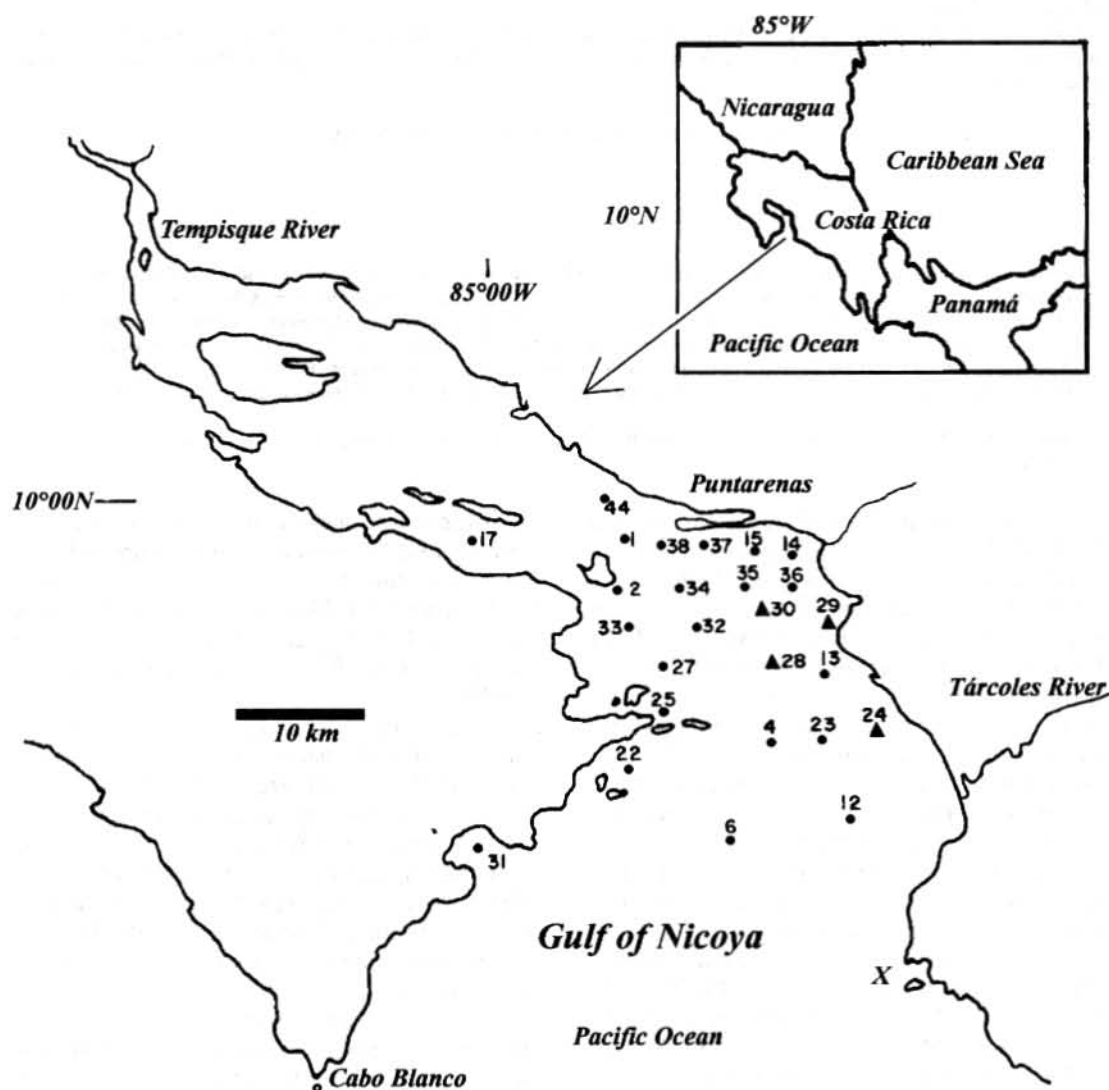


Fig. 1. Gulf of Nicoya, Pacific coast of Costa Rica. Location of the subtidal stations. Bahia Herradura is indicated by an x. Seasonal stations (24, 28, 29, 30) are also indicated by ▲.

Several additional polychaete specimens identified from the Gulf but with limited collection and locality data include *Aphrodita japonica* Marenzeller, collected "S. O. of Cabo Blanco"; *Arabella semimaculata* (Moore), collected from "Bahia Herradura" (labeled x in Fig. 1); and *Glycera dibranchiata* Ehlers, taken in the Gulf using a shrimp net at "0/75, 20 fathoms".

Four of the Gulf survey stations were selected for periodic seasonal sampling as part of a secondary productivity study (Maurer and Vargas 1984, Maurer *et al.* 1988). Consequently, three replicate bottom grab samples were taken at stations 24, 28, 29 and 30 (Fig. 1) in Oct. 1980, Jan., April, June, and August 1981. Additional samples from stations 28 and 29 were also taken in April 1982 subsequent to completion of the seasonal sampling program.

## RESULTS

Table 1 lists all the subtidal polychaete species identified from available Gulf of Nicoya material. Benthic survey station numbers and the other three collection sites are listed beneath the species name while all species occurrences at the four seasonal sample sites are shown in tabular fashion. A total of 146 species belonging to 35 families have been identified. There were 125 species from the four seasonal stations; 81 species from station 24, 51 species from station 28, 89 species from station 29 and 60 species from station 30. Table 2 lists the number of species in each family along with the assigned feeding type for each family based upon the review of polychaete feeding guilds by Fauchald and Jumars (1979).

TABLE 1

List of polychaete species identified from the Gulf of Nicoya. Station occurrences for sites other than the seasonal samples are given beneath the species name. Species occurrences at the four seasonal sample stations 24, 28, 29 and 30 are included to the right. A = July, 1980; B = Oct. 1980; C = Jan. 1981; D = April 1981; E = June 1981; F = August 1981; G = April 1982

	STATION			
	24	28	29	30
Family: Ampharetidae				
<i>Isolda bipinnata</i> (Fauchald)				
15, 22				
Family: Aphroditidae				
<i>Aphrodita japonica</i> Marenzeller				
S.O. Cabo Blanco April/1973				
Family: Arabellidae				
<i>Arabella panamensis</i> Colbath				A
<i>Arabella semimaculata</i> (Moore)				
Bahia Herradura				
<i>Drilonereis falcata</i> Moore			C F	BC
<i>Drilonereis nuda</i> Moore	BCDEFG		G	
Family: Capitellidae				
<i>Mediomastus californiensis</i> ? Hartman				
17, 22	BCDEFG	BCDEF	BCDEFG	BCDEF
<i>Notomastus luridus</i> Verrill				
22, 44	BCDEF	BCDEF	BCDEF	BCDE
<i>Notomastus tenuis</i> Moore	BCDE	CD	B EF	B D
Family: Chaetopteridae				
<i>Mesochaetopterus alipes</i> Monro		G		
<i>Phyllochaetopterus socialis</i> (Claparède)				
34		ABCDEFG		
Family: Chrysopetalidae				
<i>Paleaquor nicoyensis</i> Watson-Russel	A			
Family: Cirratulidae				
<i>Aphelochaeta longisetosa</i>				
(Hartmann-Schroeder)	BCDE	ABCDEF	C EF	BCD F
<i>Cauleriella alata</i> (Southern)	E	ABCDE G		

Table 1 (continued)

<i>Chaetozone setosa</i> Malmgren		E			
<i>Chaetozone</i> sp A		E			
<i>Chaetozone</i> sp. B	B				
<i>Monticellina tessellata</i> (Hartman)	BC F		B	ABCDEFG	B
<i>Monticellina</i> sp. A					ABCDEFG
<i>Tharyx</i> sp A					
33, 36	BCDE		ABCDEF	C EF	ABCDEFG
<i>Tharyx</i> sp B	BC E		B	AB DEF	BCD
Family: Cossuridae					
<i>Cossura brunnea</i> Fauchald					
14	BC E			C F	CD
<i>Cossura laeviseta</i> Hartmann-Schroeder	BCDEF		B	F	B E
Family: Dorvilleidae					
<i>Pettiboneia</i> sp A		E		C	C
<i>Pettiboneia</i> sp B			F		
<i>Schistomeringos annulata</i> (Moore)	B				
<i>Schistomeringos pacifica</i> Westheide					
32	CDEF		BCDEF	C EF	B D F
Family: Eulepethidae					
<i>Grubeulepis ecuadorensis</i> Pettibone				E G	
Family: Eunicidae					
<i>Eunice cedroensis</i> Fauchald					
1, 31					
Family: Flabelligeridae					
<i>Pherusa inflata</i> (Treadwell)	B		B		
Family: Glyceridae					
<i>Glycera convoluta</i> Keferstein					
14, 22	BCDEF			BCDEFG	
<i>Glycera robusta</i> Ehlers			B	CD	
<i>Glycera americana</i> Leidy					
37					
<i>Glycera dibranchiata</i> Ehlers					
Taken in the Gulf of Nicoya with a shrimp net, 0/75, 20 fathoms					
<i>Hemipodus simplex</i> (Grube)					
44	A	F		C	
Family: Goniadiidae					
<i>Glycinde multidentata</i> Müller					
12				A CDEFG	ABCDEFG
<i>Goniada brunnea</i> Treadwell	B D				ABCDEFG
Family: Hesionidae					
<i>Gyptis plurisetis</i> Hilbig		D			
<i>Gyptis</i> A					ABCDEFG
<i>Podarke minuta</i> Hartmann-Schroeder					
12, 25					
<i>Podarke pugettensis</i> Johnson	BCD F		BCD F	EF	
<i>Podarkeopsis brevipalpa</i> (Hartmann-Schroeder)	C		E	C	D
Family: Lumbrineridae					
<i>Lumbrineris limnicola</i> Hartman		CDE		B DEFG	
<i>Ninoe dolichognatha</i> Rioja				B E	

Table 1 (continued)

<i>Ninoe foliosa</i> Fauchald		D		
<i>Scoletoma erecta</i> (Moore)				
22	B DEF		D	
<i>Scoletoma monroi</i> (Fauchald)	D		E	
<i>Scoletoma platylobata</i> (Fauchald)			E G	
<i>Scoletoma tetraura</i> (Schmarda)	BCDEF	BCDE	BCD F	BCD
Family: Magelonidae				
<i>Magelona</i> (cf) <i>californica</i> Hartman				
1				
<i>Magelona pacifica</i> Monro	BCDEF		BCDEFG	BCD
<i>Magelona pitelkai</i> Hartman	B		FG	
<i>Magelona</i> sp A				
14	BCDEF	B DEF	BCDEFG	BC EF
<i>Magelona</i> sp B	BCDEF	C EF	F	BC E
Family: Nephtyidae				
<i>Aglaophamus dicirris</i> Hartman				
31				D
<i>Aglaophamus tabogensis</i> (Monro)	F		CDE	
<i>Nephtys panamensis</i> Monro				
14, 22			E	
Family: Nereididae				
<i>Ceratocephale loveni</i> Malmgren				
1, 25, 37		E	C F	
<i>Neanthes</i> sp A				
2, 27	BCD F	G	F	
<i>Neanthes</i> sp B				
4, 44	C	F	B	
<i>Neanthes</i> sp C	E			
<i>Neanthes</i> sp D				
1, 31, 32				
<i>Neanthes</i> sp E	CDE		C G	
<i>Nereis riisei</i> Grube				
31	D		C	
<i>Nereis</i> sp A				
23	D			
<i>Nereis</i> sp B	C			
Family: Onuphidae				
<i>Diopatra tridentata</i> Hartman				
31	B D F		A	
<i>Diopatra farallonensis</i> Fauchald				
6				
<i>Diopatra ornata</i> Moore				
13	BCDEF		BCDEFG	
<i>Kinbergonuphis</i> sp A			DE G	
<i>Mooreonuphis nebulosa</i> (Moore)				
31				
<i>Onuphis vexillaria</i> Moore	B	F	DE G	BCD
<i>Onuphis microcephala</i> Hartman				
14				
Family: Opheliidae				
<i>Armandia salvadoriana</i>				
Hartmann-Schroeder 38			G	
<i>Armandia brevis</i> (Moore)				C
<i>Ophelina</i> sp.			D	

Table 1 (continued)

## Family: Orbiniidae

*Leitoscoloplos elongatus* Johnson

22

B EF

B D F

C E G

C

*Orbinia riserii* (Pettibone)

31

B DE

C

*Scoloplos ohlini* Ehlers

31

BC

BC E G

A

*Scoloplos tribulosus* (Ehlers)

2, 35

A CD F

G

A

*Scoloplos treadwelli* Eisig

15

B

AB E

B D F

BC

*Scoloplos armiger* Muller

22

A

C G

B

## Family: Paraonidae

*Aricidea (Acesta) catherinae*

Laubier 12, 22

BCD

D

BCDEFG

C

*Aricidea (Acesta) finitima*

Strelzov 32

BCDEF

E

B DEFG

BCDEF

*Aricidea (Acesta) longicirrata*

Hartmann-Schroder

BCD F

BC

BCDE G

C

*Aricidea (Acesta) minima**Aricidea (Acesta) mirifica**Aricidea (Aricidea) fragilis*

Webster 2, 37

B D

C E

BCDEFG

C

*Aricidea* sp A

B F

E

F

B D

*Aricidea* sp B

DE

DE

B

*Aricidea* sp C

D

D

B

*Levensenia gracilis* (Tauber)

12

CDEF

ABCDEF

F

ABCDEF

*Paraonis* (cf) *forticirratu*s (Strelzov)

14

AB E

DE

CDEFG

B D

## Family: Phyllodocidae

*Eteone aestuarina* Hartmann-Schroeder

15

*Eteone lighti* Hartman

14

B

*Phyllodoce (Anaitides) panamensis*

Treadwell

D

*Phyllodoce madeirensis* (Langerhans)

44

D

C

*Phyllodoce nicoyensis* Treadwell

14

## Family: Pilargiidae

*Ancistargis hamata* (Hartman)

22

DEF

F

AB DEF

B D F

*Ancystrosyllis jonesi* Pettibone*Cabira* sp. A

B

C F

F

C E

CD

*Loandalia riojai* Salazar-Vallejo*Parandalia tricuspis* (Müller)*Pilargis berkeleyae* Monro*Sigambra bassi* Hartman*Sigambra tentaculata* (Treadwell)*Synelmis albini* (Langerhans)

1, 14

BCDEF

ABCDEF

A

C FG

BCDEF

*Synelmis klatti* (Friedrich)

B D

C

C

C

*Poecilochaetus tropicus* Okuda

BCD F

E

BCDEFG

CDEF

*Poecilochaetus tropicus* Okuda

EF

BC F

F

BCDE

## Family: Poecilochaetidae

## Family: Polynoidae

*Harmothoe lunulata* (delle Chiaje)*Harmothoe balboensis* Monro*Lepidonotus squamatus* (Linnaeus)

C EF

CD

E

CD

CD

G

B

C

Table 1 (continued)

<i>Polynoe</i> sp.		D			
<i>Harmothoinae</i> sp.		C			
Family: Polyodontidae					
<i>Panthalis mortenseni</i> Monro				G	
<i>Polyodontes oculaea</i> (Treadwell)					C
35					
Family: Sigalionidae					
<i>Pholoe minuta</i> (Fabricius)	B	E		CD	
<i>Sigalion</i> sp.		F			
<i>Sithenelais fusca</i> Johnson				G	
<i>Sigalionidae</i> sp.		E			
Family: Spionidae					
<i>Apoprionospio pygmaea</i> Hartman				ABCDEF	
17, 23				G	
<i>Dispio glabrilamellata</i> Blake & Kudenov				G	
<i>Dispio</i> (cf) <i>uncinata</i> Hartman				G	
<i>Laonice bassensis</i> Blake & Kudenov		D			
31		BCD	F	BC E G	B
<i>Malacocerus vanderhorsti</i> (Fauvel)					
<i>Paraprionospio pinnata</i> (Ehlers)		BCD	F	ABC EFG	BC
22		B			
<i>Polydora cornuta</i> Bosc					
<i>Polydora socialis</i> (Schmarda)		E		G	
<i>Prionospio</i> ( <i>Minuspio</i> ) <i>multibranchiata</i>					
Berkeley 23, 32, 34	BCDEF		ABCDEF	BCD FG	BCDEF
<i>Prionospio</i> ( <i>Minuspio</i> ) (cf) <i>pulchra</i>					
Imajima 13		EF	D F	G	
<i>Prionospio</i> ( <i>Prionospio</i> ) <i>dubia</i> Day	BCD	F	B D	BCDE G	C
<i>Scolecopsis</i> sp.				G	
<i>Spio blakei</i> (Blake and Kudenov)					
35					
<i>Spiophanes soederstromi</i> Hartman	B	F	A	ABC E G	B D
Family: Sternaspidae					
<i>Sternapsis scutata</i> (Ranzani)	BCDEF		F	F	
Family: Syllidae					
<i>Exogone breviantennata</i> Hartmann-Schroeder					
22					
<i>Langerhansia cornuta</i> (Rathke)					
14	CDEF		CDEF	C FG	BCDE
Family: Terebellidae					
<i>Amphitrite robusta</i> (Johnson)					
22					
<i>Loimia ingens</i> (Grube)					
15					
<i>Lysilla</i> (?) sp.				C	
15					
<i>Pseudampharete</i> sp.					
37					
<i>Streblosoma crassibranchia</i> Treadwell					
31					
<i>Thelepus</i> sp.			B		C
Family: Trichobranchidae					
<i>Terebellides reishi</i> Willians					C
34					
Family: Trochochaetidae					
<i>Trochochaeta kirkegaardi</i> Pettibone					
4					

TABLE 2

The number of polychaete species in each family identified from the Gulf of Nicoya and an assigned feeding group for each family (from Fauchald and Jumars, 1979). C= carnivore, F= filter feeder, S= surface deposit feeder, SS=subsurface deposit feeder

Family	Number of species	Feeding type
Ampharetidae	1	S
Aphroditidae	1	C
Arabellidae	4	C
Capitellidae	3	SS
Chaetopteridae	2	F
Chrysopetalidae	1	C
Cirratulidae	9	S
Cossuridae	2	SS
Dorvilleidae	4	C
Eulepethidae	1	C
Eunicidae	1	C
Flabelligeridae	1	S
Glyceridae	5	C
Goniadidae	2	C
Hesionidae	5	C
Lumbrineridae	7	C
Magelonidae	5	S
Nephtyidae	4	C
Nereididae	9	C
Onuphidae	7	C
Opheliidae	3	SS
Orbiniidae	6	SS
Paraonidae	11	S
Phyllodocidae	5	C
Pilargiidae	10	C
Poecilochaetidae	1	S
Polynoidae	5	C
Polyodontidae	2	C
Sigalionidae	4	C
Spionidae	14	S
Sternaspidae	1	SS
Syllidae	2	C
Terebellidae	6	S
Trichobranchidae	1	S
Trochochaetidae	1	S

Table 3 lists those species collected at each seasonal station on all five sampling dates (B-F). *Mediomastus californiensis?* was the only species present at all four seasonal stations at every sample date. *Notomastus luridus*, *Sigambra bassi* and *Prionospio multibranchiata* were present at all sample dates at three of the four stations.

The number and percentage of the three main feeding types at each sample site on each sample date are contained in Table 4. Surface deposit feeders made up 33-56%, carnivores 24-54%, and subsurface deposit feeders 11-23% of the species at these four stations. The filter feeder, *Phyllochaetopterus socialis*, which was collected at station 28, made up approximately 2% of the total species at that station.



TABLE 3

Those species collected on all of the five sample dates during the seasonal sampling for each of the four seasonal sample stations

Species	Station				
	24	28	29	30	
<i>Mediomastus californiensis?</i>	X	X	X	X	
<i>Notomastus luridus</i>	X	X	X		
<i>Prionospio (Minuspio) multibranchiata</i>	X	X			X
<i>Sigambra bassi</i>	X	X			X
<i>Glycera convoluta</i>	X		X		
<i>Diopatra ornata</i>	X		X		
<i>Aricidea (Acesta) finitima</i>	X		X		
<i>Magelona sp A</i>	X		X		
<i>Magelona pacifica</i>	X				X
<i>Levensenia gracilis</i>		X			X
<i>Sternaspis scutata</i>	X				
<i>Scoletoma tetraura</i>	X				
<i>Magelona sp B</i>	X				
<i>Phyllochaetopterus socialis</i>		X			
<i>Aphelochaeta longisetosa</i>		X			
<i>Tharyx sp A</i>		X			
<i>Schistomeringos pacifica</i>		X			
<i>Monticellina tessellata</i>				X	
<i>Aricidea (Aricidea) fragilis</i>				X	
<i>Aricidea (Aricidea) catherinae</i>				X	
<i>Apoprionospio pygmaea</i>				X	
<i>Synelmis albini</i>				X	

TABLE 4

The number and percentages (in parenthesis) of carnivores, subsurface deposit feeders and surface deposit feeders at each of the four seasonally sampled stations on each sample date

## Carnivores

Station	October 1980	January 1981	April 1981	June 1981	August 1981	April 1982
24	16(34)	18(42)	24(54)	16(46)	18(46)	
28	7(29)	7(43)	6(30)	8(33)	11(53)	
29	7(24)	22(49)	15(42)	17(41)	15(39)	17(38)
30	10(30)	13(35)	12(46)	4(31)	5(39)	

## Surface Deposit Feeders

Station	October 1980	January 1981	April 1981	June 1981	August 1981	April 1982
24	22(47)	17(40)	15(33)	12(34)	14(36)	
28	12(50)	6(38)	10(50)	13(54)	7(33)	
29	16(55)	17(38)	16(44)	19(45)	17(43)	23(51)
30	17(52)	17(46)	10(39)	6(46)	6(46)	

## Subsurface Deposit Feeders

Station	October 1980	January 1981	April 1981	June 1981	August 1981	April 1982
24	9(19)	8(18)	6(13)	7(20)	7(18)	
28	5(21)	3(19)	4(20)	3(13)	3(14)	
29	6(20)	6(13)	5(14)	6(14)	7(18)	5(11)
30	6(18)	7(19)	4(15)	3(23)	2(15)	

## DISCUSSION

This species list is far from complete since specimens were available from only 25 of the 41 stations originally sampled as part of the benthic survey by Maurer and Vargas (1984). Sixty-three species of polychaetes are identified here from the benthic survey material while Maurer *et al.* (1988) reported 120 species in the entire collection. Few species were identified in this study which were not included in the species list for the benthic survey material provided by Maurer *et al.* (1988).

The Gulf of Nicoya seasonal sample material (Maurer and Vargas 1983, Maurer *et al.* 1988) is much better represented here. All polychaetes taken in the three replicates at each station collected on the five sampling dates are identified here. Additional material from a single replicate at station 28 and six replicates at station 29 were collected in April 1982 subsequent to the seasonal sampling program.

Based upon preliminary identifications, Maurer *et al.* (1988) reported 78 species from the seasonal sampling material while 125 species were identified from the same material in this study. The presence of many previously unrecognized species suggests that the number of species of polychaetes previously reported from the Gulf of Nicoya (Maurer and Vargas 1984, Maurer *et al.* 1988) may be greatly underestimated. The 125 species recorded from the four seasonal stations is comparable to the 120 species of polychaetes reported from the entire Gulf of Nicoya by Maurer and Vargas (1984) and Maurer *et al.* (1988). These results underscore the probable underestimation of species richness in the Gulf survey since it was based on single replicate sampling during a single sampling period in July 1980.

The polychaete families with the greatest number of species in this collection were the Spionidae, Paraonidae, Cirratulidae, Pilargiidae, and Nereididae (Table 2). While the first three of these families are considered surface deposit feeders, members of the Pilargiidae and Nereididae are considered carnivores.

The four seasonal stations are situated relatively close together in the Gulf of Nicoya (Fig. 1) and were selected for seasonal analysis due to differences in sediment type (Maurer and Vargas 1983). Maurer *et al.* (1988) reported that Station 24 sediments were 1% silt-clay

with 50.3 mg organic carbon/gdw; station 28 sediments were 91% silt-clay with 92.2 mg organic carbon/gdw; sediments were 27% silt-clay and contained 57.6 mg organic carbon/gdw at station 29; and station 30 sediments were 38% silt-clay with 65.0 mg organic carbon/gdw. The proximity of these four stations should have minimized differences in the overlying water columns and the distribution of some of the more common species at the four stations should be reflective of differences in the sediment characteristics.

The most ubiquitous polychaete species identified from the seasonal samples was the capitellid *Mediomastus californiensis?* which was found at all four stations on all five collection dates (Table 3). Another capitellid, *Notomastus luridus*, the pilargid *Sigambra bassi*, and the spionid, *Prionospio multibranchiata*, were found on all sampling dates at three of the four stations. It seems evident that these species are capable of inhabiting a variety of sediment types and all four of these species were identified in the benthic survey work as being important components of the benthos in the Gulf of Nicoya (Maurer and Vargas 1984). Based on the Biological Index Value (BIV) of McCloskey (1970), *P. multibranchiata*, *M. californiensis?*, *S. bassi* (listed as *S. tentaculata*) and *N. luridus* were ranked numbers one, four, five and three, respectively, in the survey samples. Maurer and Vargas (1984) also ranked the pilargid, *Synelmis albini*, as the second most important species in the survey work. *S. albini* was often found to be quite abundant in the seasonal samples but its temporal distribution was patchy thus it did not occur at any of the four stations on every collection date. Another species listed in table 3 which was also identified as being of biological and numerical importance based on the Gulf survey material was *Phyllochaetopterus socialis* (listed as *P. sp.*) (Maurer and Vargas 1984).

The two stations most similar in sediment characteristics were stations 24 and 29, both with reduced silt-clay (one and 27%) and organic content (50.3 and 57.6 mg organic carbon/gdw). The glycerid, *Glycera convoluta*, the onuphid, *Diopatra ornata*, the paraonid, *Aricidea finitima*, and the magelonids, *Magelona pacifica* and *Magelona sp. A.*, all were collected on all sample dates at only these two stations (Table 3) and may perhaps be char-

acteristic species at low silt-clay content sediments. Three species, the sternaspid, *Sternaspis scutata*, the lumbrinerid, *Scoletoma tetraura*, and the magelonid *Magelona* sp. B were collected on all sample dates at the very low silt-clay, low organic content station 24 and may be considered as sandy sediment type species. In the slightly higher silt-clay, organic content sediments of station 29 the commonly collected species were the cirratulid, *Monticellina tessellata*, the paraonids, *Aricidea (Aricidea) fragilis*, and *Aricidea (Acesta) catherinae*, the spionid, *Apoprionospio pygmaea*, and the pilargid, *Synelmis albini*. These five species apparently prefer slightly muddy sands over cleaner sandy sediments.

The sediments at station 28 were very high in silt-clay content (91% silt-clay) and organic content (92.2 mg organic carbon/gdw) and four species of polychaetes were specifically common over the sampling period at this station (Table 3). These "mud" species were the chaetopterid, *Phyllochaetopterus socialis*, the cirratulids *Aphelochaeta longisetosa* and *Tharyx* sp A, and the dorvilleid *Schistomeringos pacifica*.

There were no species of polychaetes which occurred on all sample dates from only station 30. Thus no species could be identified as being characteristic of the intermediate silt-clay content (38%) and organic content (65 mg organic carbon/gdw) type sediments found at this station.

Despite recognition of several different sets of species occurring at each of the seasonal stations, there were few trends noticeable in the distribution of feeding types at the four stations (Table 4). Surface deposit feeders averaged 58%, carnivores 34%, and subsurface deposit feeders 18% of the polychaete species at these seasonal stations.

In summary, the re-examination of the polychaetes previously collected subtidally from the Gulf of Nicoya indicates that our knowledge of the polychaete community is limited. The large number of species reported here from the four seasonal stations also underscores the importance of multiple replicates to the proper assessment of benthic species richness. This is perhaps also true of our understanding of many other marine invertebrate groups since our knowledge of the Nicoyan ecosystem is also based mainly upon the single replicate samples taken by Maurer and Vargas

(1984) using what would today be considered rather crude equipment. Additionally, the taxonomic identifications reported here indicate that the number of polychaete species collected in the Gulf of Nicoya may have been greatly underestimated. The work by Maurer and Vargas (1984) and Maurer *et al.* (1988) was an invaluable pioneering effort but there is much yet to be learned about benthic communities in the Gulf of Nicoya.

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#### RESUMEN

Se identificó 146 especies de poliquetos de 35 familias en 25 estaciones submareales del Golfo de Nicoya; de ellas 125 aparecieron en muestreos múltiples tomados estacionalmente en cuatro estaciones con diferentes tipos de sedimento. Las tres especies más comúnmente recolectadas en esas estaciones fueron los capitélidos *Mediomastus californiensis?* y *Notomastus luridus* y el espionido *Prionospio multibranchiata*. Apparently la fauna de poliquetos del golfo no ha sido adecuadamente descrita y puede ser mucho más biodiversa de lo que se creía.

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