

# First larval stage of *Exhippolysmata oplophoroides* (Holthuis, 1948) (Decapoda, Caridea, Hippolytidae) obtained in laboratory.

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## Abstract

The first zoeal stage of the spine-shrimp *E. oplophoroides* is described from larvae of known parentage. These results are the first account to the knowledge of the larvae of this genus. A comparison with other described hippolytid larvae, recorded in the same geographical area, is provided.

**Key words:** first zoea, *Exhippolysmata*, caridean-shrimp, Brazilian coast.

## Introduction

The order Decapoda is a relevant group of marine organism not only due as to their economic importance but also to its role in marine systems. During its life cycle decapods go through a larval period, of which larval stages constitute a significant part of the marine plankton. Working with decapod larvae presents a main problem: the different morphology of larvae (respects to its parentage) requires the use of specific identification keys, which in many cases are insufficient due to the scarce knowledge of larval forms. This leads to the need of increasing the number of descriptive studies of decapod larval stages.

The superfamily Alpheoidea is represented along the Brazilian littoral by 38 species belonging to four families (Alpheidae, Ogyridae, Brbouriidae and Hippolytidae). From these, only 2 species of Alpheoidea have their complete larval development described: *Tozeuma carolinense* Kingsley, 1878 and *Alpheus heterochaelis* Say, 1818, described by Ewald (1969) and Knowlton (1973), respectively. In addition, the first zoeal stage of *Hippolyte zostericola* (Smith, 1873) was described by Negreiros-Fransozo *et al.* (1996).

According to Williams (1984), *Exhippolysmata oplophoroides* (Holthuis, 1948) is distributed from North Carolina, USA (Off Cape Fear River) to Port Aransas, Texas, from Guyanas to north of Uruguay. This hippolytid shrimp is known in the São Paulo littoral as spine-shrimp due to its dorsal carina ending in a strong, posteriorly directed spine in the third abdominal somite. This species has been taken near shore, from 0 to 27 m deep and it is usually captured among penaeidean shrimps, mainly *Xiphopenaeus kroyeri* (Heller, 1869). Ovigerous females of *E. oplophoroides* can be found all year-round in the northern coast of São Paulo (Chacur and Negreiros-Fransozo, 1999).

This paper provides the description of the first larval stage of *E. oplophoroides* hatched in laboratory from ovigerous females. A comparative analyses was also accomplished for the two other previously studied hippolytid larvae, recorded in nearby waters.

## Material and Methods

Ovigerous females of *E. oplophoroides* were caught by trawl during shrimp fisheries in the Ubatuba bay (23° S 45° W). They were posteriorly transported to the laboratory in aerated sea-water and kept in aquaria until the larvae hatching. The hatched larvae were fixed in formalin (10%) and afterwards transferred to a mixture of alcohol and glicerine (1:1). The drawings were made under a microscope provided with a camera lucida. The description of each appendage is presented below following the number of setae from the proximal to distal segments as recommended by Clark *et al.* (1998). Cephalotorax length was measured from anterior margin of eyes to the posterior lateral margin of carapace. Setal counts on appendages were based on at least 10 specimens.

## Results

First zoea of *Exhippolyasmata oplophoroides* (Fig. 1 and 2)

Cephalotorax length =  $0.474 \pm 0.019$  mm (mean  $\pm$  95% confidence intervals; N=16).

Carapace (Fig. 1) flattened, without pterygostomian spine and teeth on antero-ventral margin. Rostrum short and tapering, not reaching the distal end of the peduncle of the antennule. Eyes not stalked.

Antennule (Fig. 2B) slender with an unsegmented naked peduncle. Endopod as a long plumose seta. Exopod with 1 sparsely plumose seta plus 4 slender aesthetascs.

Antenna (Fig. 2C). Peduncle naked. Endopod elongated and tapering plumose seta bearing a minute spine at the beginning of the setules. Exopod 6-segmented with 2 plumose setae on outer side and 9 plumose setae plus 1 short simple seta on inner side, as illustrated.

Mandible. Palp absent.

Maxillule (Fig. 2D). Coxal endite with 6 sparsely plumose setae. Basial endite with 2 strong tooth-like setae and 2 sparsely plumose setae. Endopod unsegmented with 2 plus 3 sparsely plumose setae. Exopod not present.

Maxilla (Fig. 2E). Coxal endite bilobed with 10 plumose setae on the proximal lobe and 4 plumose setae on the distal lobe. Basial endite bilobed with 4 sparsely plumose setae each. Endopod unsegmented with 2 + 2 + 1 + 3 sparsely plumose setae. Exopod with 2 plumose setae on the outer margin plus 3 longer plumose setae on the distal margin.

First maxilliped (Fig. 2F). Coxa with 1 + 1 + 2 plumose setae. Basis with 3 + 3 + 3 + 3 sparsely plumose setae. Endopod 4-segmented reaching middle of exopod, with 3, 1, 2, 3 sparsely plumose setae, respectively. Exopod unsegmented with 1 subapical and 3 apical plumose setae.

Second maxilliped (Fig. 2G). Coxa naked. Basis with 1 + 2 + 3 sparsely plumose setae. Endopod 3-segmented, extending beyond middle of exopod, with 3 + 1, 2, 5 sparsely plumose setae, respectively. Exopod 4-segmented with 2, 2, 2, 3 long plumose.

Third maxilliped (Fig. 2H). Coxa with 1 sparsely plumose seta. Basis with 1 + 1 + 1 sparsely plumose setae. Endopod 3-segmented longer than exopod, with 2 + 1 sparsely plumose setae, 1 + 3 plumodenticulate setae, 3 plumodenticulate setae, respectively. Exopod 5-segmented with 0, 2, 1, 2, 3 long plumose setae.

Pereiopods absent.

Abdomen (Figs 1, 2A) 5-segmented. Somites I to IV naked. Somite V with a pair of small dorso-lateral spinous processes.

Pleopods and uropods absent.

Telson (Fig. 2A) broad, with a median cleft. Process formula 7 + 7. Outermost seta is inserted nearly halfway up side.

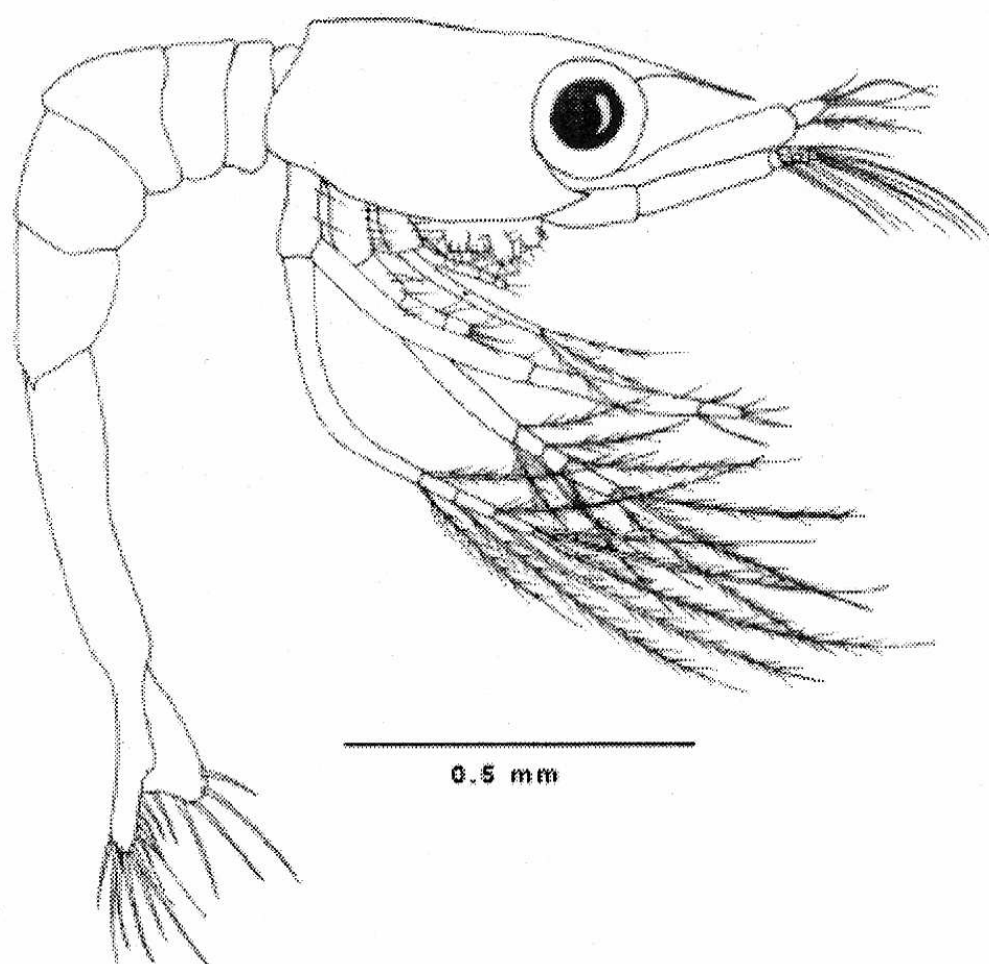


Figure 1: *Exhippolyasmata oplophoroides* (Holthuis, 1948). First zoea.

## Discussion

The larval features of the first larval stage of *E. oplophoroides* follow the characters previously described to other first stage hippolytid larvae. These larvae are easily differentiated by the presence of antennules with bases very close together, if separated never more than the width of one of them, by the presence of a segmented antennal scale (exopod) and by the absence of pereopods (if present, looking as buds).

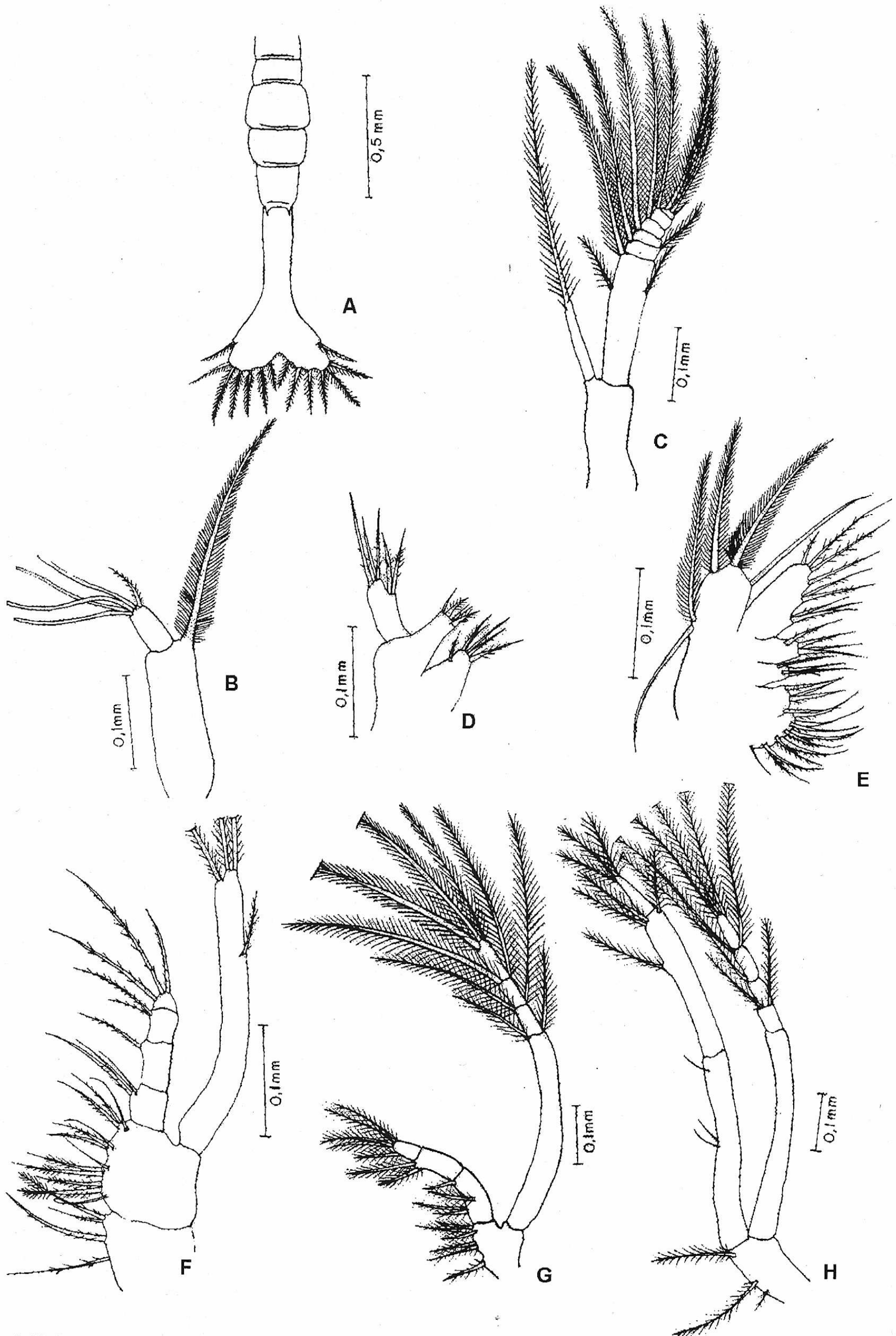


Fig ee 2: *Exhippolydina oplophoroides* (Holthuis, 1948). First zoea: A, abdomen; B, antennule; C antenna; D, maxillule; E, maxilla; F, first maxilliped; G, second maxilliped; H, third maxilliped.

Table I: Comparison of the characters of the first larval stages in caridean shrimps from Brazilian southeastern previously described.

Species	<i>H. zostericola</i>	<i>T. carolinense</i>	<i>E. oplophoroides</i>
author(s)	Negreiros-Fransozo <i>et al.</i> (1996)	Ewald (1969)	present study
<b>Carapace</b> (dorsal surface)	smooth and 4-5 pterigostomial spines	two dorsal prominences and 1 pterigostomial spine	smooth and 1 pterigostomial spine
<b>Abdomen</b> (on the 3rd somite)	no spines	1 medio dorsal spine	no spines
<b>Antennule</b> (on distal segment)		2-4 aesthetascs + 1 seta	4 aesthetascs + 1 plumose setae
<b>Antennal scale</b>	9 to 10 plumose setae	2-segmented with 10 plumose setae	6-segmented with 11 plumose setae + 1 spine
<b>Flagellum</b>	small triangular spine at its base	smooth	small spine at the setule basis
<b>Maxillule</b>			
Endopod	5 terminal plumose setae	5 spines	5 plumose setae
Basal endite	5 spines	5-6 teeth	2 spines + 3 plumose setae
Coxal endite	5+1 plumose setae	4-6 distal + 2 proximal setae	5+1 plumose setae
<b>Maxilla</b>			
Endopod	8 plumose setae	9 plumose setae	9 plumose setae
Basal endite	7 + 4 plumose setae	4 + 4 plumose setae	4 + 4 plumose setae
Coxal endite	8 + 3 plumose setae	4 + 6 plumose setae	4 + 10 plumose setae
<b>First Maxilliped</b>			
Coxa	4 setae	6 plumose setae	4 plumose setae
Basis	11 setae	11 setae	12 plumose setae
Endopod	3,1,2 and 4 plumose setae	3,2, 1 and 3 setae	3,1, 1 (2) and 3 setae
Exopod	4 + 1 plumose setae	3+1 plumose setae	3 + 1 plumose setae
<b>Second Maxilliped</b>			
Coxa	1 plumose setae	2 plumose setae	naked
Basis	9 plumose setae	6 plumose setae	6 plumose setae
Endopod	3,2,2 and 3(5) setae	3, 1, 2 and 4 setae	4, 2 and 5 setae
Exopod	0,0, 1 and 4 plumose setae	3 + 1 plumose setae	2,2,2 and 3 plumose setae
<b>Third Maxilliped</b>			
Basis	2 setae	4 setae	3 setae
Endopod	1, 0, 2 and 4 plumose setae	2,1, 3 and 3 setae	3, 4, and 3 setae
Exopod	0,0, 2 and 3 plumose setae	3+2 setae	0, 2, 1, 2 and 3 long setae

The hippolytid species from the Brazilian coast, with any known larval stage are *E. oplophoroides*, *T. carolinense* and *H. zostericola*, which can be easily distinguished by the ornamentation of the carapace and abdominal somites. The species *E. oplophoroides* has only one pterigostominal spine on the carapace, *T. carolinense* has 2 dorsal prominences and 1 pterigostominal spine on the carapace while *H. zostericola* has 4 or 5 pterigostominal spines on the carapace. The three species have a pair of postero-lateral spines on the 5<sup>th</sup> abdominal somite but *T. carolinense* has 1 medio-dorsal spine on the 3<sup>rd</sup> somite while in *H. zostericola* and *E. oplophoroides* it is not present. In addition, there are so many details in the maxillule, maxilla and maxillipeds that these can be used to separate these larvae in the plankton (table I).

Only a growing database on the descriptive work of laboratory obtained larval stages, allows the correct identification of planktonic zoeae, beyond contributing with useful information to elucidate the complex classification of the decapod crustaceans.

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Received: 20<sup>th</sup> Jan 2002  
Accepted: 08<sup>th</sup> Aug 2002