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A REVIEW OF BIVALVE SPECIES IN THE EASTERN ADRIATIC SEA. III. PTERIOMORPHA (GLYCYMERIDIDAE)

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The bivalve species *Glycymeris bimaculata* (Poli, 1795), *G. glycymeris* (Linnaeus, 1758) and *G. violacescens* (Lamarck, 1819) of the family Glycymerididae (Pteriomorpha) are reviewed. Literature citations, specimens deposited in collections, and unpublished data were consulted. For each species the valid name, Adriatic Sea synonyms, shell sizes, general and eastern Adriatic distribution, collection depths, habitat and biocenological characters, ecological significance, abundance, bivalve collections and additional relevant data are recorded. The results are discussed, and further study of certain species is suggested.

Key words: Bivalve (Pteriomorpha), Glycymerididae, taxonomy, ecology, distribution, Adriatic Sea.

Legac, M. & Hrs-Brenko, M.: Pregled vrsta školjkaša u istočnom Jadranu. III. Pteriomorpha (Glycymerididae), Nat. Croat., Vol. 8, No. 1., 9–25, 1999, Zagreb

Nastavljena je obrada skupine školjkaša i to vrste *Glycymeris bimaculata* (Poli, 1795), *G. glycymeris* (Linnaeus, 1758), and *G. violacescens* (Lamarck, 1819) iz porodice Glycymerididae (Pteriomorpha). U radu su korišteni navodi iz literature, malakoloških zbirki, kao i do sada neobjavljeni podaci. Za svaku vrstu uz važeći naziv zabilježene su istoznačnice za Jadran, veličine ljuštura, opća i jadranska rasprostranjenost, dubine nalaza, obitavališta i biocenološke karakteristike, ekološka značajnost, obilnost nalaza, pohranjenost u zbirkama i drugi važniji navodi. Rezultati istraživanja pojedinih vrsta su raspravljeni, te je naglašena potreba daljnjih istraživanja.

Ključne riječi: Školjkaši (Pteriomorpha), Glycymerididae, taksonomija, ekologija, rasprostranjenje, Jadransko more.

INTRODUCTION

The present review of three species from the Glycymerididae family is a continuation of an earlier review of the species from the Arcidae and Noetiidae fami-

lies (Pteriomorpha, Arcoida) (HRS-BRENKO & LEGAC, 1996). The species from the other two related families Limopsidae and Philobryidae have not been found in the eastern Adriatic Sea.

MATERIALS AND METHODS

Publications dating from DANILO & SANDRI (1855), museum documents, and recent unpublished data collected at the eastern part of the Adriatic Sea were the basis for this review.

Glycymeris individuals were collected by skin and scuba divers, »mušular« dredges, bottom trawl nets, and by Van Veen and Petersen grabs. The collected bivalves were identified to species level according to TEBBLE (1966), NORDSIECK (1969), and PARENZAN (1974). For each species, valid names in current use, confirmed by SABELLI *et al*. (1990) and CLEMAM (**C**heck **L**ist of **E**uropean **MA**rine **M**ollusca) of the MNHN, Paris, and synonyms relating to the *Glycymeris* species in the Adriatic Sea are used.

The bivalve shell lengths and widths were measured by a vernier caliper. The quoted minimum and maximum sizes refer to our data or sizes noted by other authors. The first cited number is the shell length (the distance between anterior and posterior margin), and the second one is the shell height (the distance from beak to the ventral part). In the figures of the species distribution map, each finding is illustrated by a »•«, and a »➢« when the exact finding point is not indicated precisely. Collection depths include literature notes and our data.

The presence of the reviewed species in a particular community is shown by abbreviations proposed by PICARD (1965), GAMULIN-BRIDA (1967), and ZAVODNIK (1971):

- PSW = community of photophilic seaweeds,
- MP = community of marine phanerogams,
- SGBC = community of coarse sands and fine gravel under the influence of bottom currents,
- FWCS = community of fine well-calibrated sand,
- CDO = community of coastal sandy detritic bottom partly mixed with ooze.

Abbreviations of the names of original collections used in the text:

- MCMF = the Malacological Collection at the Museum of the Franciscan Monastery in Makarska (RADIĆ, 1970),
- CNHM = the Spiridion Brusina Collection deposited at the Croatian Natural History Museum in Zagreb (ILIJANIĆ & STOŠIĆ, 1972),
- SIC = the collection of the ex Istituto Italo-Germanico di Biologia Marina di Rovigno d'Istria, now deposited at the Stazione Idrobiologica in Chioggia (MARCUZZI, 1972),
- NHDCM = the Mollusks collection of Father Blaž Cvitanović at the Natural History Department of the City Museum in Zadar. The original list of the bivalve species collection was published by CVITANOVIĆ (1973), and specimens deposited in the museum were reviewed by LEGAC (1991),

– NHMS = part of the B. Cvitanović bivalve collection deposited at the Natural History Museum in Split (V. GOLUBIĆ, pers. comm.),
– COEN = Coen personal collection, and several museum collections in – MCV = Venice, – MCC = Chioggia, – MCT = Trieste (COEN, 1937),
– NHMR = the Natural History Museum in Rijeka,
– CMR = the Center for Marine Research of the »R. Bošković« Institute in Rovinj,
– MNHN = the Muséum National d'Histoire Naturelle, Paris,
– CLEMAM (**C**heck **L**ist on **E**uropean **MA**rine **M**ollusca, MNHN, Paris).

RESULTS

Subclassis PTERIOMORPHA Beurlen, 1944
Ordo Arcoida Stoliczka, 1871
Family Glycymerididae Newton, 1916
Genus Glycymeris Da Costa, 1778

Glycymeris bimaculata (Poli, 1795: *Arca*) (Figs. 1, 2)

Adriatic synonyms:

? *Pectunculus glycimeris* Lamarck: DANILO & SANDRI, 1855; HELLER, 1864; BRUSINA, 1891.

Fig. 1. *Glycymeris bimaculata* (Poli, 1795) (coll. CMR, photos by G. Sošić).

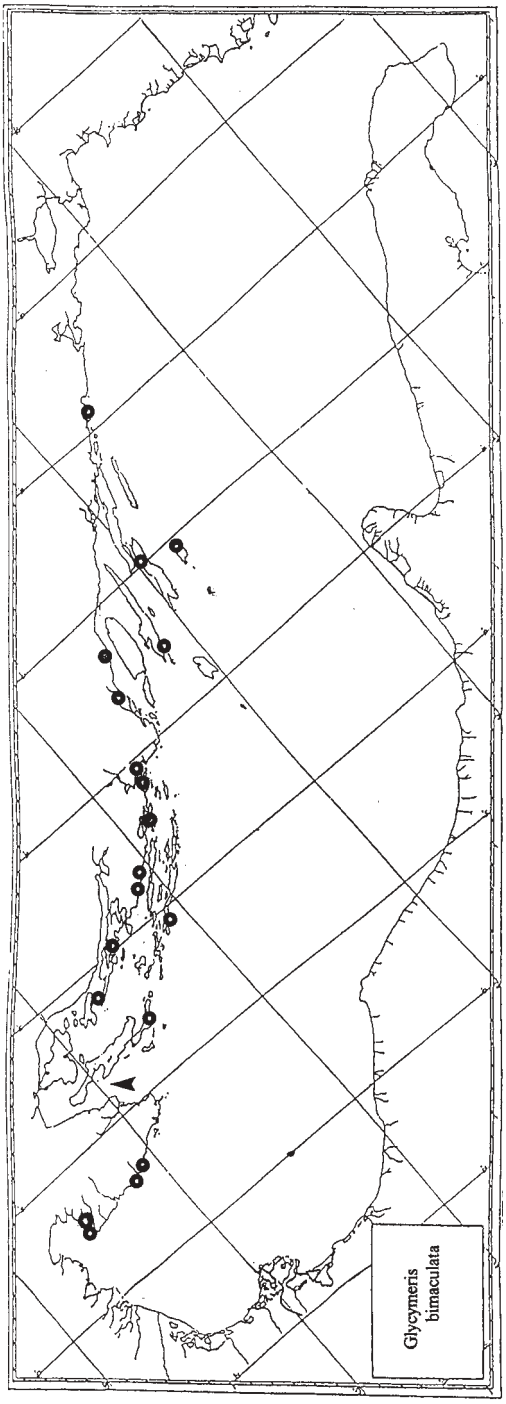

Fig. 2. Distribution of *Glycymeris bimaculata* in the eastern Adriatic Sea (● finding place, ➤ finding place is not known precisely).
Sl. 2. Rasprostranjenost vrste *Glycymeris bimaculata* na istočnoj obali Jadranskog mora (● nalazište, ➤ točno nalazište nije poznato).

? *Axinea glycymeris* Linnaeus BRUSINA, 1866.

* *Pectunculus glycimeris* Linnaeus: STOSSICH A., 1866; STALIO, 1872, STOSSICH M., 1880; FABER, 1883; WIMMER, 1883; ILIJANIĆ & STOŠIĆ, 1972.

Pectunculus stellatus Lamarck: STALIO, 1872.

Pectunculus (Axinea) bimaculatus Poli: COEN & VATOVA, 1932–1934.

Axinaea bimaculata Poli: BRUSINA, 1907.

Pectunculus bimaculatus Poli: VATOVA, 1932; 1943; ILIJANIĆ & STOŠIĆ, 1972.

* *Pectunculus (Axinea) glycymeris* Linnaeus: COEN & VATOVA, 1932–1934.

Glycymeris bimaculata Poli: COEN, 1937; FREDJ, 1974, PARENZAN, 1974; LEGAC & HRS-BRENKO, 1982; LEGAC, 1987; POUTIERS, 1987; LEGAC & FABIJANIĆ, 1994; VIO & DE MIN, 1996; LEGAC & ZAVODNIK (in press).

* *Pectunculus glycymeris* Linnaeus: HORVATH, 1963.

Glycimeris bimaculata Poli: MARCUZZI, 1972.

Glycymeris stellata Bruguiere: RADIĆ, 1982.

Sizes**:** 60,5/56,1 to 99,1/98,8 mm.

General distribution: Atlantic Sea (Gibraltar to Canary Islands) and Mediterranean Sea (except Black Sea) (NORDSIECK, 1969; SCARLATO & STAROBOGATOV, 1972; PARENZAN, 1974; POUTIERS, 1987; SALAS, 1996).

Eastern Adriatic distribution: Izola, Piran, Vrsar (Kuversada Island), Rovinj (wide area), Kvarner, Lošinj Island, Rab Island (Barbatski kanal), Pag Bay, Dugi otok Island, Zadar, Biograd, Vodice, Šibenik, Murter Island (Betina), Split, Omiš, Hvar, Korčula, Lastovo, Dubrovnik.

Collection depths: 2 to 30 m.

Habitat: Lives in shallow water where it burrows in the sediment (mud, sand, sand with gravel) frequently in the vicinity of fresh water inflows.

Recorded in the **SGBC** community on coarse sand and fine gravel under the influence of bottom currents (VIO & DE MIN 1996, LEGAC unpublished).

Abundance: Common species in the eastern Adriatic Sea, earlier abundant in Pag Bay where it is today seriously decimated.

Ecological significance: According to the literature, this has not yet been established.

Ecology: Animal burrows into sand, not very deep, with characteristic siphonal openings being visible on the bottom (Fig. 3). A diver has counted up to 29 siphonal openings on 24 m^2 at 2.7 m in depth at Filino Cape in Pag bay (LEGAC & FABIJANIĆ, 1994).

Biology: Juveniles were found in February (VATOVA, 1943).

Collections: MCV, COEN (COEN, 1937), CNHM (ILIJANIĆ & STOŠIĆ, 1972), SIC (MARCUZZI, 1972), NHMR, and CMR.

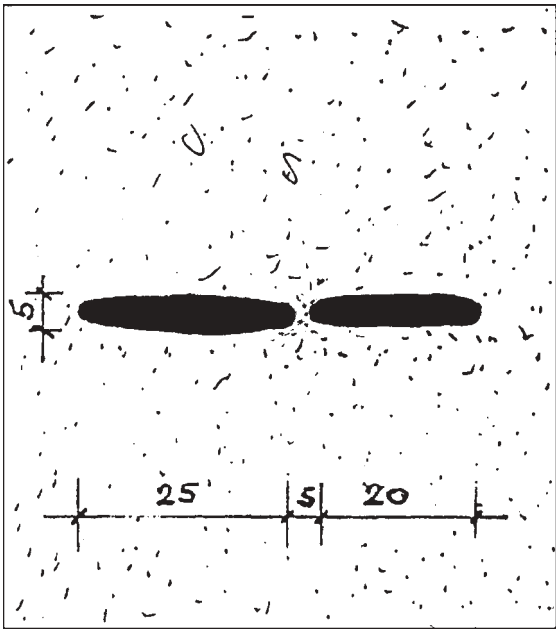

Fig. 3. Siphonal openings of *Glycymeris bimaculata* on sea bottom. Measuring scale in mm. (sketched by I. Vranić) (after LEGAC & FABIJANIĆ, 1994).

Sl. 3. Sifonalni otvori (tulajice) vrste *Glycymeris bimaculata* na morskom dnu. Mjerna skala u mm. (crtež: I. Vranić) (prema LEGAC & FABIJANIĆ, 1994).

Remarks: * according to » ! *Pectunculus glycymeris* sensu Lamarck, 1819 non Linné, 1758« cited as a synonym of *Glycymeris bimaculata* by SABELLI *et al*. (1990) and CLEMAM, we inserted all *P. glycymeris* Linnaeus found in old Adriatic literature into the list of synonyms of *G. bimaculata*.

? we suppose that *Axinea glycymeris* Linnaeus (BRUSINA, 1866) is also a synonym of *Glycymeris bimaculata*. In the same publications Brusina mentioned *A. pilosa* Linnaeus, probably thinking of *G. glycymeris*.

A well known vernacular name for *Glycymeris bimaculata* is »konjina«, and »caška« or »čaška«, used in the Pag Bay area. An abundance of large individuals in Pag Bay was recorded in the past century (DANILO & SANDRI, 1855; FABER, 1883; STOSSICH M., 1880). Bivalves have been intensively fished mainly because of their large and nice shells used as for souvenirs and only occasionally for consumption by local people. The rather tough meat is mostly used as bait for fishing. Earlier, large shells were also used for the building of doors »porte di casa« in the village of Kolan on Pag Island (BRUSINA, 1866). Populations of this species together with other bivalves are seriously decimated by uncontrolled sand exploitation in Pag Bay (Pag Island) and Barbatski kanal (Rab Island), and by in-

tensive dredging in Pag Bay (LEGAC & HRS-BRENKO, 1982; LEGAC, 1987; LEGAC & FABIJANIĆ, 1994). To save the species, either protective legislation or total local prohibition of sand digging and dredging is urgently recommended.

Glycymeris glycymeris (Linnaeus, 1758: *Arca*) (Figs. 4, 5)

Adriatic synonyms:

Pectunculus flammulata Renier: DANILO & SANDRI, 1855.

Pectunculus pilosus Lamarck: DANILO & SANDRI, 1855; LORENZ, 1863; GRUBE, 1861; 1864; HELLER, 1864; BRUSINA, 1891.

Pectuculus flamulatus Renier: HELLER, 1864; STOSSICH A., 1886.

Pectuculus flammulatus (Arca) Renier: BRUSINA, 1891.

Pectunculus pilosus Linnaeus: STALIO, 1872; STOSSICH M., 1880; HORVATH, 1963; ILIJANIĆ & STOŠIĆ, 1972; CVITANOVIĆ, 1973.

Axinea pilosa Linnaeus: BRUSINA, 1866.

Pectunculus glycymeris Forbes & Hanley: ZIMMERMANN, 1907.

Pectunculus glycimeris Forbes: GRAEFFE, 1903.

Pectunculus glycimeris Forbes & Huxley: VATOVA, 1928.

Pectunculus (Axinea) pilosus: COEN & VATOVA, 1932–1934.

Glycymeris pilosa Lamarck: COEN, 1937.

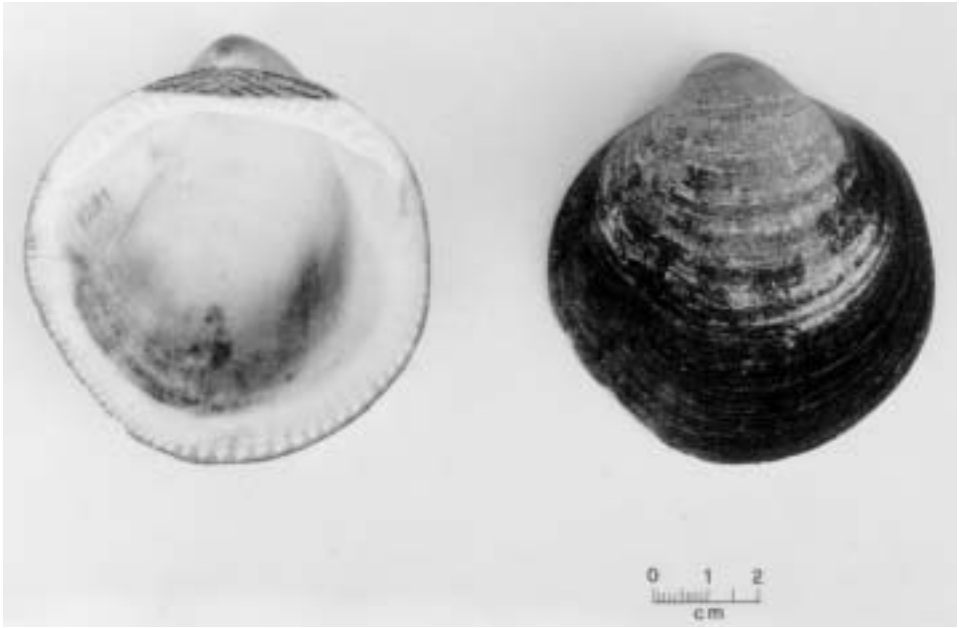

Fig. 4. *Glycymeris glycymeris* (Linné, 1758) (coll. NHMR, photos by G. Sošić).

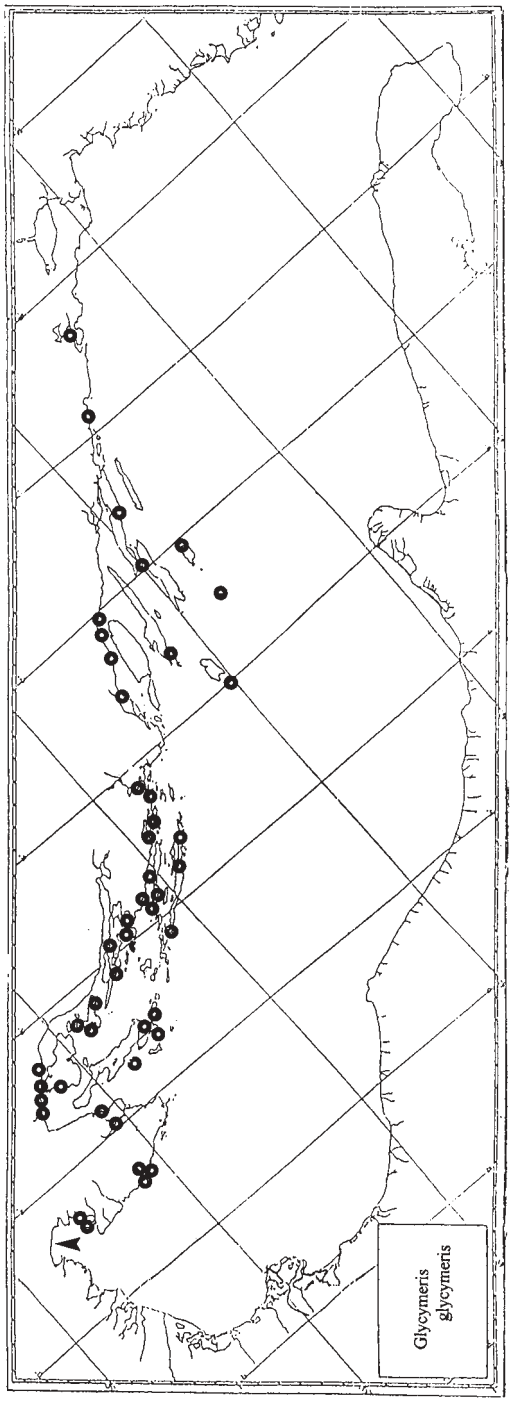

Fig. 5. Distribution of *Glycymeris glycymeris* in the eastern Adriatic Sea (● finding place, ➤ finding place is not known precisely).
Sl. 5. Rasprostranjenost vrste *Glycymeris glycymeris* na istočnoj obali Jadranskog mora (● nalazište, ➤ točno nalazište nije poznato).

Glycymeris glycymeris Linnaeus: COEN, 1937; STJEPČEVIĆ, 1967; RADIĆ, 1970; 1982; FREDJ, 1974; LEGAC & HRS-BRENKO, 1982; ZAVODNIK & ZAVODNIK, 1986; POUTIERS, 1987; SENEŠ, 1988; MARGUŠ *et al*., 1991; HRS-BRENKO & LEGAC, 1992; VIO & DE MIN, 1996; HRS-BRENKO, 1997; HRS-BRENKO *et al*., 1998.

Glycimeris pilosus Linnaeus: GAMULIN-BRIDA, 1967a, b.

Glycymeris pilosa Linnaeus: STJEPČEVIĆ, 1967; RADIĆ, 1970; 1982; FREDJ, 1974; LEGAC & HRS-BRENKO, 1982; LEGAC, 1987; STJEPČEVIĆ *et al*., 1982; POUTIERS, 1987.

Pectunculus lineatus Philippi: CVITANOVIĆ, 1973.

Glycymeris pilosus Linnaeus: SENEŠ, 1988.

Glycimeris glycimeris Linnaeus: STARMÜHLNER & SALVINI-PLAWEN, 1970; KARAMAN & GAMULIN-BRIDA, 1970; ZAVODNIK, 1971; MARCUZZI, 1972; GAMULIN-BRIDA, 1974; ZAVODNIK *et al*., 1981; MARGUŠ *et al*., 1991.

Glycimeris (=Pectunculus) pilosa Linnaeus: MARCUZZI, 1972.

Glycymeris (Glycymeris) glycymeris Linnaeus: STOLFA ZUCCHI, 1972–73.

Glycimeris pilosa Linnaeus: GAMULIN-BRIDA, 1967a; 1974; KARAMAN & GAMULIN-BRIDA, 1970; STARMÜHLNER & SALVINI-PLAWEN, 1970; PÉRÈS & GAMULIN-BRIDA, 1973; LEGAC, 1974, ZAVODNIK & VIDAKOVIĆ, 1982.

Sizes: 20,0/- to 87,8/87,2 mm.

General distribution: Atlantic Ocean (Norwegian and Baltic Sea to Senegal), Mediterranean Sea (except Black Sea) and in Pacific Ocean. (FREDJ, 1974; POUTIERS, 1987; SALAS, 1996).

Eastern Adriatic distribution: Gulf of Trieste, Izola, Piran, Vrsar (Kuversada Island), Limski kanal, Rovinj (wide area), Raša Bay, Rabac, Rijeka, Kostrena, Kačjak, Kraljevica (Oštro cape), Krk Island (Omišaljski zaljev), Zeča Islet, Lošinj Island (Čikat inlet), Sv Grgur Island, Rab Island (Barbatski kanal, Lopar peninsula), Pag Island (Pag Bay, Šimuni), Lošinj kanal, Unije kanal, Vir Sea, Privlaka, Zadar, Zadarski kanal, Pašmanski kanal, between Ugljan Island and Ošljak Islet, Dugi otok Island (Veli Rat, Telašćica Bay), Kornati Islands, Murter Island (Betina, Murter), Krka River estuary, Vodice, Biograd, Split, Omiš, Baška voda, Makarska, Sušac Islet, Biševo Islet, Hvar, Pelješac (Žuljana), Korčula, Lastovo, Mljet Island, Dubrovnik, Boka Kotorska Bay.

Collection depth: 5 to 62 m.

Habitat: Burrows in the sediment (mud, sand, sand with gravel).

Recorded in the following communities: 1. in the **PSW** in the enclaves of sediment substrate of the *Cystoseira* facies; 2. in the **MP** developed on sandy or muddy sand bottom in the *Cymodocea nodosa* and *Posidonia oceanica* facies; 3. in the **SGBC** with *Amphioxus*; 4. in the aphytal **FWCS** in both *Pecten jacobaeus* and *Lithophyllum racemus* facies, and especially in *Glycymeris glycimeris – Pecten jacobaeus* facies spread in the southern Adriatic Sea; 5. in the northern Adriatic Sea, in the **CDO** developed on detritic bottoms partly mixed with ooze, in several facies such as *Arca noae – Hippodiplosia, Chlamys opercularis – Ophiothrix quinque-*

maculata, *Lithothamnium* alge, and in the transition zone to detritic mud with shell debris (VATOVA, 1928; PÉRÈS & GAMULIN-BRIDA, 1973; GAMULIN-BRIDA, 1974; SENEŠ, 1988; VIO & DE MIN, 1996).

Ecological significance: A strictly sandy species characteristic of the community of coarse sands and fine gravel under the influence of bottom currents (ZAVODNIK, 1971; GAMULIN-BRIDA, 1974).

Abundance: A common species on sandy bottoms.

Biology: In February 1990, three month after benthic mass mortality in the northern Adriatic Sea, juveniles ranging from 2.6 to 3.5 mm in size, probably *Glycymeris glycimeris*, were collected (HRS-BRENKO, unpublished).

Collections: MCV, COEN (COEN, 1937), MCMF (RADIĆ, 1970), CNHM (ILIJANIĆ & STOŠIĆ, 1972), SIC (MARCUZZI, 1972), NHMS (V. GOLUBIĆ, pers. comm.), NHMR, and CMR.

Remarks: We support the suggestions of SABELLI *et al*. (1990) that *G. glycymeris*, *G. pilosa*, and *G. lineata* are conspecific, and of SALAS (1996) that *Glycymeris pilosa* is a form of *G. glycymeris* with a heavier periostracum.

Glycymeris violacescens (Lamarck, 1819: *Pectunculus*) (Figs. 6, 7)

Adriatic Synonyms:

Pectunculus insubricus Brocchi: DANILO & SANDRI, 1855; STOSSICH M., 1880.

Pectunculus nummarius Lamarck: DANILO & SANDRI, 1855; STOSSICH A., 1866; STALIO, 1872; BRUSINA, 1891.

Pectunculus numarius Lamarck: HELLER, 1864.

Axinea violascens Lamarck: BRUSINA, 1866.

Pectunculus violascens Lamarck: STOSSICH A., 1866.

Pectunculus violacescens Lamarck: STALIO, 1872.

Pectunculus insubricus Sandri: GRAEFFE, 1903; ZIMMERMANN, 1907; VATOVA, 1928.

Pectunculus insubricus (*Arca*) Brocchi: BRUSINA, 1891.

Axinea nummaria Linnaeus: BRUSINA, 1907.

Axinea (Pectunculus) nummaria Linnaeus: CVITANOVIĆ, 1973.

Glycymeris violacescens Lamarck: COEN, 1937; STJEPČEVIĆ, 1967; FREDJ, 1974; PARENZAN, 1974; LEGAC & HRS-BRENKO, 1982; RADIĆ, 1982; LEGAC, 1987; 1991; POUTIERS, 1987; SENEŠ, 1988.

Glycimeris violacescens Lamarck: STARMÜHLNER & SALVINI-PLAWEN, 1970.

Glycimeris insubricus Brocchi: GAMULIN-BRIDA, 1967b; 1974; PÉRÈS & GAMULIN-BRIDA, 1973.

Glycymeris violascens Lamark: RADIĆ,1970.

Pectunculus nummarius Linnaeus: ILIJANIĆ & STOŠIĆ, 1972.

Glycimeris violascens Lamarck: MARCUZZI, 1972.

Glycymeris insubrica Brocchi: VIO & DE MIN, 1994; 1996; HRS-BRENKO, 1997.

Fig. 6. *Glycymeris violacescens* (Lamarck 1819) (coll. NHMR, photos by G. Sošić).

Sizes: 9,4/8,9 to 53,3/50,8 mm.

General distribution: Atlantic Sea (southern France to Mauritania), Mediterranean Sea (FREDJ, 1974; PARENZAN, 1974; POUTIERS, 1987).

Eastern Adriatic distribution: Gulf of Trieste, Umag, Novigrad, Rovinj (wide area), Kvarner Bay, Krk Island, Rab Island (Lopar peninsula, Barbatski kanal), Pag Island, Vir Sea, Privlaka, Dugi otok Island (Veli Rat), Kornati Islands, Zadar, Makarska, Pelješac (Žuljana), Korčula, Boka Kotorska Bay, Dubrovnik.

Collection depth: 2 to 40 m.

Habitat: Burrows in sandy bottoms.

Recorded in the following communities: 1. in the **MP** of *Posidonia oceanica* – shallower facies; 2. in the aphytal **FWCS** in the facies *Cardium tuberculatum-Pitaria chione* (the southern Adriatic); 3. in the **CDO** on detritic bottoms partly mixed with ooze in small or large quantities and spread in the northern Adriatic Sea

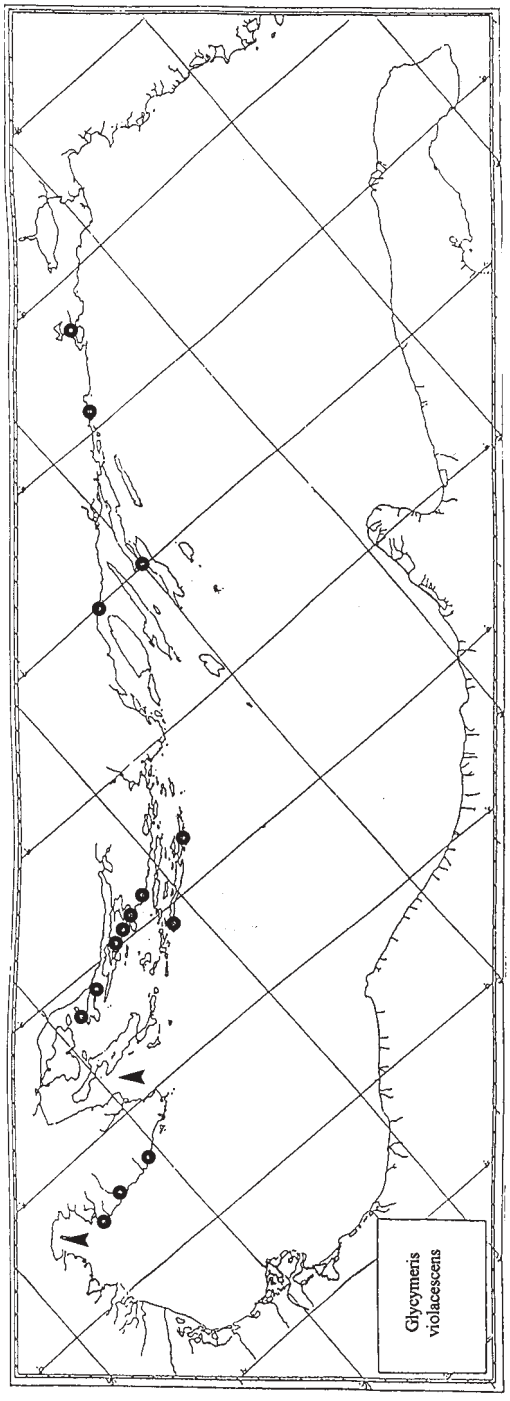

Fig. 7. Distribution of *Glycymeris violacescens* in the eastern Adriatic Sea (● finding place, ➤ finding place is not known precisely).
Sl. 7. Rasprostranjenost vrste *Glycymeris violacescens* na istočnoj obali Jadranskog mora (● nalazište, ➤ točno nalazište nije poznato).

(VATOVA, 1928; GAMULIN-BRIDA, 1967b; 1974; PÉRÈS & GAMULIN-BRIDA, 1973; SENEŠ, 1988; VIO & DE MIN, 1994; 1996).

Ecological significance: A preferential species in the community of fine well-calibrated sands (GAMULIN-BRIDA, 1974; VIO & DE MIN, 1994).

Abundance: A rarer species in the eastern Adriatic Sea than on the western side where sandy bottoms are widely spread.

Ecology: Empty shells of recently dead juveniles on sandy bottoms in the transitory zone to phanerogam meadows were found (LEGAC & HRS-BRENKO, 1982; LEGAC, 1987). BRUSINA (1907) pointed out the morphological difference in west Adriatic individuals which are flatter than those on the east side.

Collections: COEN, MC, MAC, MCT (COEN, 1972), NHDCMZ (CVITANOVIĆ, 1973, LEGAC, 1991), NHMS (V. GOLUBIĆ, pers. comm.), NHMR, and CMR.

Remarks: *Glycymeris violacescens* (Lamark), a valid species name in current use, proposed by CLEMAM, instead of *G. insubrica* (Brocchi), is accepted by us. *G. insubrica* (Brocchi) is a Pliocene fossil species (S. GOFAS, pers. comm.)

DISCUSSION

Through the present elaboration of three *Glycymeris* species from the family Glycymerididae, and an earlier work related to several species of Arcidae and Noetidae families (HRS-BRENKO & LEGAC, 1996), the review of the eastern Adriatic species belonging to the order Arcoida (Pteriomorpha) is completed.

For many years, from BRUSINA (1866 and 1907) to very recent publications, in the Adriatic Sea malacological literature there has been a taxonomical confusion about the number of *Glycymeris* species. *G. glycimeris* and *G. pilosa* were considered separate species by many authors (BRUSINA, 1866; 1907; MONTEROSATO, 1899; NORDSIECK, 1969; POUTIERS, 1987; ZENETOS, 1996 and others). Recently, three valid species, i.e. *G. bimaculata* (Poli), *G. glycymeris* (Linnaeus), and *G. violacescens* (Lamarck) have been established (SABELLI *et al*., 1990; SALAS, 1996, VIO & DE MIN, 1996; CLEMAM, MNHN, Paris). SABELLI *et al*. (1990) »consider *glycymeris*, *pilosa,* and *lineata* conspecific«. SALAS (1996) suggested that *G. pilosa* is a form of *G. glycymeris* with a heavier periostracum. Moreover, the author raised the question whether *G. bimaculata* and *G. glycymeris* are really distinct species or only flatter morphotypes. Further comprehensive studies should solve the *Glycymeris* taxonomical problem.

The present review indicates that in the Adriatic Sea both *Glycymeris bimaculata* and *G. glycymeris* are common species occupying almost the same bottoms, i.e. from sandy to rough sandy and fine gravel (GAMULIN-BRIDA, 1974; SENEŠ; 1988; VIO & DE MIN, 1994; LEGAC unpublished). Since the third species, *G. violacescens*, prefers fine well-calibrated sands it is less abundant on the eastern Adriatic Sea, where such a type of sandy bottom is rare. The finding of large sized individuals of all three *Glycymeris* species together in the northern part of Pag Bay (BRUSINA, 1907) gives

this site the status of locus classicus. In conclusion, our knowledge about particular *Glycymeris* species in the eastern Adriatic Sea is insufficient, especially about their distribution area and abundance.

According to old literature dating from DANILO & SANDRI (1855), BRUSINA (1866, 1907), STOSSICH (1880), FABER (1883), and others, the largest species *Glycymeris bimaculata* was earlier especially abundant in Pag Bay. An uncontrolled exploitation of sandy and sandy-gravelly bottoms, at many localities, especially in the northern insular zones (Pag and Rab Islands), and increased dredging activity seriously decimated the number of individuals that need urgent protection (LEGAC & HRS-BRENKO, 1982; LEGAC, 1987; LEGAC, 1990; LEGAC & FABIJANIĆ, 1994; FABIJANIĆ, pers. comm.).

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SAŽETAK

Pregled vrsta školjkaša u istočnom Jadranu. III. Pteriomorpha (Glycymerididae)

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Preglednim radom vrsta iz porodice Glycymerididae završena je obrada školjkaša reda Arcoida (Pteriomorpha). Obrađene vrste *Glycymeris bimaculata* (Poli 1795), *G. glycymeris* (Linnaeus 1758) i *G. violacescens* (Lamarck 1819) su nastavak ranijeg pregleda porodica Arcidae i Neotidae s pripadnim vrstama (HRS-BRENKO & LEGAC, 1996). Pregled nije uključio predstavnike porodica Limopsidae i Philobryidae, jer do sada vrste tih porodica nisu zabilježene u istočnom dijelu Jadranskog mora.

U radu su korišteni navodi iz literature od sredine prošlog stoljeća do najnovijih publikacija, zatim malakoloških zbirki, kao i do sada još neobjavljeni podaci. Za svaku vrstu uz važeći naziv zabilježene su istoznačnice za vrste iz publikacija koje se odnose na istočni dio Jadrana. Pored toga navedene su veličine ljuštura, opća i jadranska rasprostranjenost, dubine, obitavališta, biocenološke karakteristike, ekološka značajnost, obilnost nalaza, pohranjenost u zbirkama, i drugi važniji podaci.

Pregledom jadranske literature uočeno je dugogodišnje neslaganje u broju vrsta roda *Glycymeris*, to jest između vrsta *G. glycymeris*, *G. pilosa*, *G. flammulatus* i *G. bimaculata*. Prema novijim radovima u Jadranu bi bile za sada nazočne tri vrste i to: *Glycymeris bimaculata* (Poli), *G. glycymeris* (Linné), and *G. violacescens* (Lamarck). Smatra se da je vrsta *G. pilosa* samo forma vrste *G. glycymeris* sa jače izraženim dlakavim periostrakumom. Čak se potavlja pitanje da li su vrste *G. bimaculata* i *G. glycymeris* zasebne vrste. Odgovor na ta pitanja mogla bi dati genetska istraživanja.

Od za sada nazočnih vrsta roda *Glycymeris* u Jadranu, vrsta *G. glycymeris* je česta na raznim pomičnim dnima od pješčano-muljevitih do fino šljunkovitih. Konjina, *G. bimaculata*, prema starijim autorima bila je vrlo česta osobito u Paškom zaljevu. Danas je ta vrsta značajno prorijeđena kako u Barbatskom kanalu tako i u Paškom zaljevu. Ugrožene vrste *G. bimaculata* i *G. glycymeris* je potrebno zaštiti od učestalog vađenja pijesaka kao i intenzivnijih dredžanja posljednjih godina. Treća vrsta *G. violacescens* rjeđe dolazi u pjeskovitim dnima istočne obale Jadrana.