Fullonica u uvali Verige na Brijunima

Fullonica *in Verige Bay on the Brijuni Islands*

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Fulonika u uvali Verige građena je na maritimnoj vili iz 1. st. Ostaci velikih lacunae i manjih četvrtastih bazena ispred njih, još stoje izvrsno sačuvani in situ u sjevernom dijelu uvale. Fullonica se smjestila između terma i gospodarskog dijela maritimne vile, djelomično prebrisavši raniju izgradnju na gospodarskom dijelu. Zgrada s vanjskim portikatima i unutrašnjim dvorištima u koju su bili smješteni pogoni fullonicae*, izgrađena je nakon izgradnje vile. Prema dimenzijama građevnog materijala (spica) pripada razdoblju izgradnje različitom od vremena izgradnje vile. Način na koji je nova zgrada smještena kao i način na koji je anulirala raniju izgradnju na tom dijelu, govori o njenom kasnijem postanku. Slične promjene i izgradnja proizvodnih pogona može se pratiti i na nekim drugim maritimnim vilama u Istri (Barbariga, Fornače). Uzgoj ovaca i proizvodnja vune u Istri poznata je još u 1. st. i o njoj piše Plinije Stariji (Plin., Nat . hist., 8, 191). Vrlo uspješna ekonomija na bazi stočarstva uključivala je uzgoj stada ovaca, dobivanje mesa, mlijeka, sira i vune na planinskim dijelovima Istre. Proizvodnji vunenih tkanina, njihova obrada i bojanje bila je organizirana u vilama uz more u trenutku kada one gube svoju izrazito reprezentativnu funkciju. Završna obrada takvih tkanina izuzetno je složeni proces koji je bio pod upravom carskih nadglednika-*procuratora*. Druga pogodnost za razvoj fulonika na ovom području bili su nalazi sumpora potrebnog za izbjeljivanje tkanina. Poznati su nalazi sumpora (sumporni izvori) u Istarskim toplicama na sjeveru Istre. Važna su i prirodna nalazišta (staništa) školjaka tipa volak od kojih se dobivala purpurna boja.*

Ključne riječi: fullonica, lacunae, Brijuni, maritimna vila, fullones, 1. - 6. st.

The fullonica in Verige Bay was built over a maritime villa dating from the 1st century. The remains of large lacunae and smaller square pools in front of them are still very well preserved in situ in the northern part of the bay. The fullonica is situated between the baths and farm buildings of the maritime villa, and its construction partially erased earlier facilities of the farm complex. The building with external porticos and internal atria which housed the fullonica installations was built after the villa. Judging by the size of the construction material (spica), it belongs to a different construction period from that of the villa. The location of the new building and the way in which it erased earlier structures on the same plot prove that it was built at a later date. Similar modifications and the construction of production facilities can be observed in other maritime villas in Istria, too (in Barbariga and Fornače). Sheep farming and wool production took place in Istria as early as in the 1st century and they were described by Pliny the Elder (Plin., Nat. hist., 8, 191). A very successful economy driven by cattle breeding included sheep farming and the production of meat, milk, cheese and wool in the Istrian mountains. The weaving of woollen cloth and its treatment and dyeing were organised in coastal villas which, by that time, had lost their strictly representative function. The final treatment of such cloth was a very complex process that was managed by imperial supervisors, the procurators. Another factor which favoured the development of fullonicae in this region was the sulphur deposits necessary for bleaching the cloth. The sulphur deposits in Istarske Toplice in northern Istria are well known. Other important factors include the habitats of the murex shell which yields a purple dye.

Key words: fullonica, lacunae, Brijuni, maritime villa, fullones, 1st – 6th c.

U Istri je stočarstvo bilo zastupljeno na brdskim i planinskim krajevima srednje i sjeverne Istre. Prije dolaska Rimljana autohtono stanovništvo pretežno se bavilo stočarstvom. Osvajanje Histrije završeno je padom Nezakcija 177. g. pr. Kr. Plodno zemljište razdijeljeno je rimskim veleposjednici-

In Istria, cattle farming was carried out in the hilly and mountainous zones of the central and northern part of the region. Prior to the arrival of the Romans, the indigenous population mostly raised cattle. The fall of Nesactium in 177 B.C. marked the final conquest of Istria. The fertile land was

Sl. 1 Zgrada s vanjskim porticima - *fullonica* u sjevernom dijelu zaljeva Verige

Fig. 1 Building with external porticos - fullonica in the northern section of Verige Bay

ma i kolonistima, dok je autohtono stanovništvo (ono koje nije ostalo raditi na zemljišnim posjedima kao robovska radna snaga) potisnuto u planinska područja. Antički pisci pišu o teškoćama kontrole njihova kretanja u vrijeme sezonskih migracija stada i o životu koje je bilo teško nadzirati (Matijašić 1998, 357). Ekstenzivni uzgoj ovaca i dobivanje vune na obroncima Ćićarije, bilo je istovjetno stočarstvu na subalpskim obroncima područja Krasa - sjeverne Istre i sjeverne Italije (akvilejski ager). Slobodne površine za ispašu u šumama i na pašnjacima planinskog dijela Istre i sjeverne Italije čine jedinstveno područje povoljno za uzgoj ovaca. Ovdje se uzgajaju ovce bogate runom koje se šišaju dva puta na godinu i daju 1-2 kg vune po ovci (D' Inca 2004, 208). U antici je proizvodnja mesa, mlijeka i sira bila samo lokalnog značaja, dok je najvažnija bila proizvodnja vune. Plinije Stariji spominje slabo cijenjenu vunu istarsku i liburnsku od koje se izrađuju grube tkanine (Plin. *Nat. hist*. 8, 191). Već prerađena i nošena vuna pogodnija je i mekša za ponovnu obradu i izradu kvalitetnih tkanina. Trgovina suknom dokumentirana je nađenim rimskim natpisima u kojima se spominju trgovci suknom, npr. natpis iz Pule *Q. CATUCIUS SEVERIANUS NEGOTIANS VESTIARIUS* (D' Inca 2004, 211). Fulonike u Istri bile su dio sjevernojadranskih radioničkih pogona za proizvodnju tkanina koje su se distribuirale putem trgovina u velikim urbanim središtima (Aquileia, Tergeste, Pola, Parentium). Proizvodnja vunenih tkanina, njihova obrada, izbjeljivanje i bojenje bilo je organizirano u radionicama u velikim urbanim središtima, a

distributed to Roman aristocrats and colonists, while the indigenous inhabitants (those that did not stay to work on farms as enslaved labour) were pushed into the mountains. Roman writers recorded that it was very difficult to control their movement during the seasonal migrations of herds (Matijašić 1998, 357). Extensive sheep farming and wool production on the slopes of Ćićarija were very similar to the practices on the subalpine slopes of the Kras region in northern Istria and northern Italy (*Aquileia ager*). Clear pastures in the forests and in the mountainous part of Istria and northern Italy form a unique region characterised by very favourable conditions for sheep farming. Sheep that are raised here are sheared twice a year and each of them produces between 1 and 2 kg of wool annually (D' Inca 2004, 208). In ancient times, the production of meat, milk and cheese was important only for local communities, whereas the most significant economic activity was the production of wool. Pliny the Elder mentioned that Istrian and Liburnian wool was not highly appreciated and was used for weaving rough cloth (Plin. *Nat. hist*. 8, 191). Woollen cloth that had already been treated and worn was softer and better suited for the production of high-quality cloth. The cloth trade was recorded in surviving Roman inscriptions that mention cloth traders, such as the inscription from Pula *Q. CATUCIUS SEVERIANUS NEGOTIANS VESTIARIUS* (D' Inca 2004, 211). The Istrian *fullonicae* were part of the northern-Adriatic workshops for the production of cloth, which was then

kasnije i u vilama uz morsku obalu. Morska voda bila je važna za stabilizaciju boje.

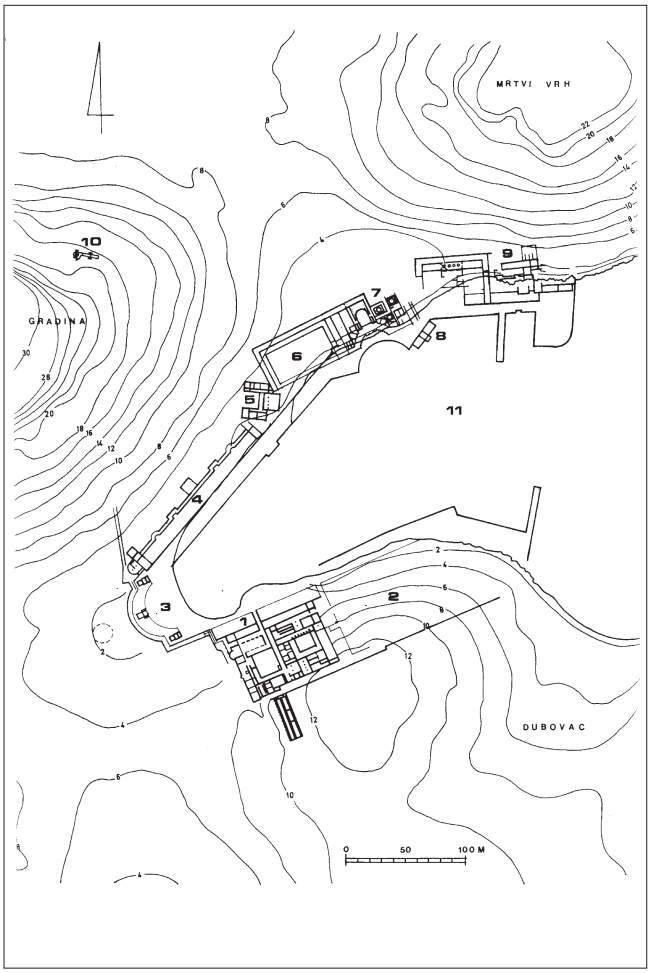
U vrijeme kada maritimna vila na Brijunima gubi svoju izrazito reprezentativnu ulogu, u njezine prostore smješteni su pogoni fulonike. Gradi se zgrada s vanjskim portikatima, smještena između terma i gospodarskog dijela vila (sl. 1).

Maritimna vila u uvali Verige izgrađena je u 1. st. kao središte velikog posjeda kojeg su činila 14 otoka brijunskoga arhipelaga ukupne površine 736 ha. Prva vila u uvali Verige tipa *villa rustica* bila je građena na južnim obroncima brda Dubovac, na razini 9 m iznad površine mora. Prvi stupanj njezina proširenja pokazuje vlasnikov ekonomski napredak i promjenu statusa i razvija se u dva dijela. Prema zapadu izgrađuje se *villa urbana,* elegantna rezidencija s peristilom, građena na istoj terasi (razini) kao i *villa rustica*. Drugi dio izgrađen je na nižoj terasi (umjetnoj platformi) s pročeljem prema moru koncipiranom kao šetnica s lođama, te prostorijama za goste (iza šetnice) grupiranim oko dva atrija. Postupno je cijeli kompleks na padinama brda Dubovac bio preuređen i izgrađen na četiri terase međusobne visinske razlike oko 12 m i ukupne površine 10000 m^2. Razdoblje nadogradnje *villae urbanae* datirano je nalazom amfore iz Laekanijeve radionice sa žigom *Viat(or)* u kasno Augustovo ili Tiberijevo razdoblje (Bezeczky 1998, 68). Tijekom konzervatorskih radova 1992. g. iskop u nasipu ispod stepeništa koji vodi u novi peristil otkrio je ulomak posude *terra sigillata* iz sredine Augustova razdoblja koja daje čvrsti *terminus post quem* za izgradnju rezidencijalnog dijela na četiri terase. Terase i platforme koje su pružale različite panoramske poglede, prostorije i portikati koji su se spuštali prema obali zaljeva (sve do u kamenu građene obale) označavaju je kao pravu maritimnu vilu. Triklinij s eksedrama zauzimao je središnji položaj na trećoj terasi i pružao najljepše vizure za otmjene goste. Otvoreni ambulatorij, širine 11 m, prostirao se ispred portika s lođama dugačkog 80 m i širokog 6 m. U vilu su vodila četiri ulaza - dva monumentalna sa stupovima s istoka i zapada i dva servisna sa sjevera (od mora) i juga (iz vrtova na četvrtoj terasi). Luksuzni dodaci koji su građeni uz obalu zaljeva prema sjeveru tijekom daljnja tri razdoblja proširenja vile odaju postaugustovski ukus elitnog stanovanja i arhitektonskog oblikovanja. Tijekom tih razdoblja dodani su hramovi, *diaeta*, *porticus miliaria*, biblioteka (*diaeta*), palestra, terme i gospodarski dio. Izgradnja hramova, *diaetae* i *porticus miliaria* datirana je u Klaudijevo razdoblje nalazom brončanog novca cara Klaudija iz 41. g. u mortu zida. Prema P. Casariju, postojao je običaj da se novoiskovani novčić umetne u mort zida građevine koja se gradila u to vrijeme (Casari 2004, 66). Prije izgrađeni rezidencijalni blok i hramovi skladno su povezani sustavom portika i kriptoportika u jednu cjelinu. Prirodno zakrivljeno dno uvale bilo je obrubljeno polukružnim portikom koji je zatvarao aksijalnu postavu tri mala hrama. Na sjeverni hram nadovezuje se *diaeta* (sastavljena od tri prostorije) koja čini početak velikog portika dužine 150 m i širokog 10 m, s naizmjenično pravokutnim i polukružnim eksedrama. Iza portika, slijedeći liniju eksedra, proteže se kriptoportik širine 2,3 m. Tijekom arheoloških istraživanja u ovim prostorijama nađeno je više od 100 ulomaka amfora sa žigovima Laecanius-a Bassus-a i žigovima 5 njegovih upravitelja (*vilici*) koje

distributed through stores in large urban centres (Aquileia, Tergeste, Pola, Parentium). The production of woollen cloth, including its treatment, bleaching and dyeing, was organised in workshops in big towns, but later also in coastal villas. The sea water was important for dye stabilisation.

At the time when the maritime villa on the Brijuni Islands lost its strictly representative function, a part of its premises was used to house a *fullonica*. A new building with external porticos was built between the baths and the farm buildings (Fig. 1).

The maritime villa in Verige Bay was built in the 1st century at the centre of a large estate that comprised 14 islands of the Brijuni Archipelago, with a total surface area of 736 ha. The first villa in Verige Bay was a *villa rustica* erected on the southern slopes of Dubovac hill, 9 m above sea level. The first phase of its extension indicates that its owner was economically successful and that his status had improved. The villa was extended in two directions. On its western side a *villa urbana* was built. It was an elegant residential building with a peristyle, constructed on the same level as the *villa rustica*. The second part was built on a lower terrace (an artificial platform) with the façade facing the sea, consisting of a promenade with loggias and guest quarters (behind the promenade) grouped around two atria. The entire complex on the slopes of Dubovac hill was gradually reconstructed and situated on four terraces with an altitude difference of 12 m, covering 10,000 m^2 in total. The extension of the *villae urbanae* was dated by an amphora from the Laecanius workshop imprinted with a *Viat(or)* stamp in the late period of Augustus's rule or in the rule of Tiberius (Bezeczky 1998, 68). During the conservation excavations carried out in 1992, a fragment of a *terra sigillata* pot from the middle of the Augustan period was discovered beneath the steps leading to the new peristyle. The peristyle provided a firm *terminus post quem* for the construction of the residential quarters built on four terraces. The terraces and platforms that offered different scenic views, as well as the rooms and porticos that descended towards the bay, all the way to the stone-built waterfront, are characteristic of a true maritime villa. A *triclinium* and *exedrae* occupied the central space on the third terrace and provided upper-class guests with a most beautiful view. An open ambulatory, 11 m wide, went alongside the portico with loggias that was 80 m long and 6 m wide. The villa could be entered from four sides – through two monumental entrances with pillars on the eastern and western sides, and two service entrances on the northern side (from the sea) and southern side (from the gardens on the fourth terrace). The luxurious extensions erected along the shore of the bay during the next three phases reflect a post-Augustan taste for elite housing and architecture. These extensions included temples, *diaeta*, *porticus miliaria*, a library (*diaeta*), *palaestra*, *thermae* and farm buildings. The construction of the temples, *diaetae* and *porticus miliaria* was dated in the period of Claudius on the basis of the bronze coins, minted during the reign of the Emperor Claudius, found in the wall's mortar. According to P. Casari, a custom existed at the time to insert a newly minted coin into the mortar of a wall of a newly constructed building (Casari 2004, 66). The previously erected residential quarter



Sl. 2 Tlocrt maritimne vile u zaljevu Verige (Begović Dvoržak 1995) 1. rezidencijalni dio; 2. vrtovi; 3. hramovi; 4. *porticus miliaria*; 5. biblioteka (*diaeta*); 6. palestra; 7. terme; 8. *piscina vivaria*; 9. *fullonica*; 10. nimfej, vodospreme i akvedukt; 11.

Fig. 2 Ground plan of the maritime villa in Verige Bay (Begović Dvoržak, 1995) 1. residential quarters; 2. gardens; 3. temples; 4. porticus miliaria; 5. library (diaeta); 6. pallaestra; 7. thermae; 8. piscina vivaria; 9. fullonica; 10. nimpheum, water tanks and aqueduct; 11. port

Sl. 3 Velike vodospreme na gospodarskom dijelu maritimne

Fig. 3 Large water tanks in the farm section of the maritime villa

je Bezeczky datirao u razdoblje od cara Tiberija do Klaudija (Bezeczky 1998, 51-52). Dalje prema istoku, uz obalu na veliki portik nadovezuje se biblioteka (*diaeta*) i palaestra, otvoreno vježbalište okruženo dvostrukom kolonadom. Povezane s palestrom su terme, dvoetažni objekt koji je bio namijenjen za vježbanje u zatvorenim prostorijama i kupanje. Terme su na gornjem katu imale veliku središnju dvoranu s apsidom iza koje se prostirao vrt. Uz nju su bili bazeni za hladnu, toplu i vruću vodu, te parna kupelj (*frigidarium, tepidarium*, *caldarium i sudatio*). Kotlovnice u substrukcijama zagrijavale su podove (sustav hipokausta), te toplu i vruću vodu. Ispred terma bio je elegantni polukružni portik s jonskim kapitelima i dvije prostorije za odmor, tlocrta zaokrenutog pod 45° od osnovnog plana objekta. Prostorije zaokrenute od osnovnog tlocrta predstavljaju inovacije koje se u rimskoj arhitekturi ne javljaju prije Nerona (primjer *Domus Aurea* u Rimu). Ispred terma bila je pravokutna *piscina vivaria* (bazen za živu ribu), s

and the temples are connected with a system of porticos and *cryptoportici.* The natural curve of the bay was reflected in the semi-circular portico which closed the axial arrangement of the three small temples. Next to the northern temple there is a *diaeta* (composed of three rooms) which marks the beginning of a large portico (150 m long and 10 m wide), with alternating rectangular and semi-circular *exedrae*. Behind the portico there is a *cryptoporticus,* 2.3 m wide, which follows the line formed by the *exedrae*. The archaeological excavations in this portion of the villa revealed more than a hundred amphorae fragments that bore the stamp of Laecanius Bassus and the stamps of his five managers (the *vilici*), which Bezeczky dated in the period ranging from Tiberius's reign to that of Claudius (Bezeczky 1998, 51-52).

Further towards the east, next to the large portico, there is a library (*diaeta*) and *palaestra* – an open training field surrounded by a double colonnade. The *palaestra* is linked to the *thermae*, a two-storey structure intended for indoor physical exercise and bathing. The upper floor of the *thermae* consisted of a large central hall with an apse, behind which there was a spacious garden. Next to the central hall there were pools with cold, warm and hot water, and a steam bath (*frigidarium, tepidarium*, *caldarium* and *sudatio*). Furnaces in the understructure heated the floors (a hypocaust system),

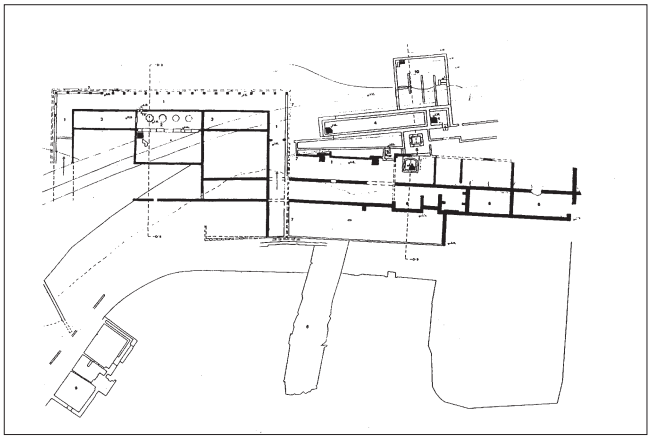
pregrađenim komorama za držanje različitih vrsta riba (Jurišić 1997, 164). Gospodarski i servisni dio vile nalazio se na kraju uvale u podnožju brežuljka Mrtvi vrh (sl. 2). Gospodarski dio građen je na nekoliko terasa. Najviši dio čine stambene prostorije na padini brda Mrtvi vrh, u čijem sastavu je pronađeno urušeno kameno stubište. Na prvoj terasi iznad obale mora istraženo je dvorište tipa *atrium impluvium,* oko kojeg su bile grupirane prostorije (sl. 3). Na nešto povišenom položaju iznad toga dijela, približno 1 m, ukopane u padinu brijega nalazile su se dvije velike cisterne za vodu, građene u *opus caementiciumu*, izvana obložene lomljenim kamenom u mortu (sl. 4). Pod vodosprema bio je izveden u *opus spicatumu*. Vodospreme dimenzija 26 x 3,2 m i 4,4 x 3,2 m postavljene su u nizu tj. nadovezuju se jedna na drugu, spojene užim stranama. Sudeći po velikim vodospremama, gospodarski dio bio je između ostalog namijenjen za pranje i čišćenje za potrebe vile. Je li imao neku drugu namjenu, nemoguće je ustanoviti jer je taj dio kasnije bio adaptiran za pogone *fullonicae*, a nova izgradnja smještena je između terma i gospodarskog dijela i djelomično na stariji gospodarski dio vile (sl. 5). Vrijeme izgradnje *fullonicae* nije sa sigurnošću utvrđeno. Njezina izgradnja je evidentno kasnija od izgradnje maritimne vile u 1. st. Objekt fulonike je naknadno interpoliran i djelomično je preslojio prijašnju izgradnju. Spike iz poda, izvedenog u tehnici *opus spicatum,* različitih su dimenzija od onih s rezidencijalnog dijela vile građenog u 1. st. (Begović, Schrunk 1999, 433) - 10, 5 x 1,8 cm dimenzija spika na novoizgrađenom objektu u gospodarskom dijelu vile prema 11,7 x 2,2 cm dimenziji spike na rezidencijalnom dijelu. Kasnija izgradnja na vili u uvali Verige interpolirana je između raskošnih terma (iz druge pol. 1. st.) i gospodarskog dijela vile, vidljivo kasnije građena po oblikovanju i položaju, a također i po različitim dimenzijama građevnog materijala (sl. 6). Taj, kasnije interpolirani, dio vile arheološki je istražio A. Vitasović 1977. g., a skladišta uz teretni mol M. Jurišić i M. Orlić 1986. g. Nova izgradnja je objekt okružen porticima. Prema sjevernoj strani očuvan je portik u ukupnoj dužini 60 m, a širine 4,13 m. Iz njega se preko dvije kamene stube pristupa u veliko dvorište 17 x 10 m. U dvorištu su nađene izvrsno očuvane dvije kamene *lacunae* (promjera oko 2 m) i dva postolja za *lacunae* istih dimen-

Sl. 4 Gospodarski dio maritimne vile građen na terasama

Fig. 4 Farm buildings of the maritime villa, constructed on terraces

as well as the warm and hot water. Beneath the *thermae* there was an elegant semi-circular portico with Ionian capitals and two resting rooms. The ground plan of the resting rooms was rotated by 45º from the layout of the main structure. This was an innovation that had not been present in Roman architecture prior to Nero's period (an example is *Domus Aurea* in Rome). In front of the *thermae* there was a rectangular *piscina vivaria* (a pool for freshwater fish), with separate sections for different kinds of fish (Jurišić 1997, 164). The farm buildings and service quarters were situated at the end of the bay, at the foot of Mrtvi Vrh hill (Fig. 2). The farm buildings were erected on several terraces. The highest ground was occupied by residential buildings situated on the slope of Mrtvi Vrh hill. A flight of steps that had collapsed was discovered in this portion of the villa.

On the first terrace from the sea, research has been conducted on an *atrium impluvium* and surrounding rooms (Fig. 3). On an elevation above that section, two large water cisterns were dug into the hill slope. They were made in *opus caementicium*, and covered by crushed stones in mortar (Fig. 4). The floor of the tanks was made in *opus spicatum*. The tanks, 26 x 3.2 m and 4.4 x 3.2 m, were placed next to one another, so that they share the shorter wall. The large size of the cisterns indicates that the so-called farm buildings were also used for washing and cleaning. It is impossible to determine whether they also had other functions, due to their later reconstruction as *fullonica*. The new buildings intended for the same purpose were situated between the baths and the farm buildings and partially over the older farm facilities (Fig. 5). The *fullonica* has not been precisely dated. It was quite obviously built af-



Sl. 5 Gospodarski dio maritimne vile u uvali Verige i zgrada s vanjskim porticima interpolirana između terma i gospodarskog dijela - tlocrt (Begović Dvoržak 2003) 1. portik; 2. dvorište; 3. *fullonica*; 4. vodospreme; 5. *atrium impluvium*; 6. skladišta; 7. kanalizacija; 8. pristanište; 9. *piscina vivaria*; 10. stambene prostorije

Fig. 5 Farm and production buildings of the maritime villa in Verige Bay and the building with external porticos, interpolated between the thermae and farm buildings – ground plan (Begović Dvoržak 2003) 1. portico; 2. courtyard; 3. fullonica; 4. water tanks; 5. atrium impluvium; 6. warehouses; 7. sewage system; 8. landing pier; 9. piscina vivaria; 10. residential rooms

Sl. 6 *Fullonica* i *lacunae* u dvorištu gospodarskog dijela vile u uvali Verige

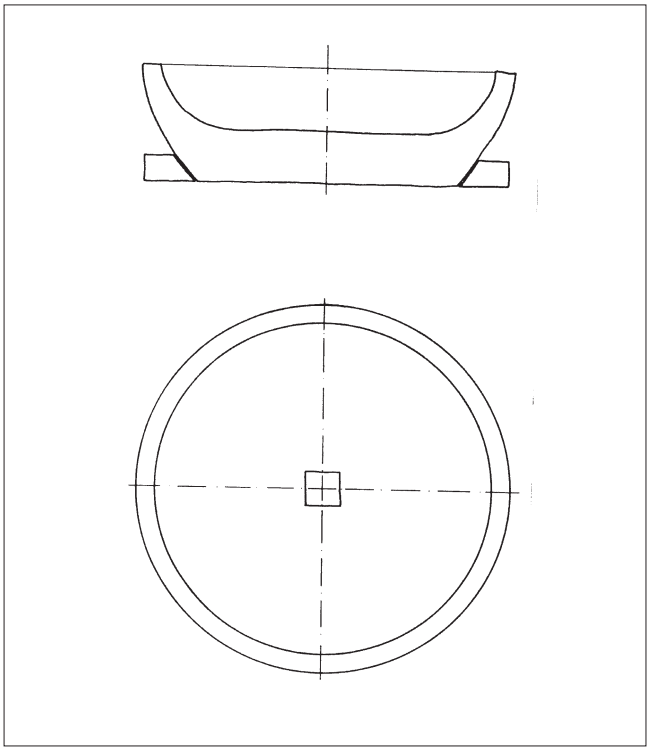
Fig. 6 Fullonica and lacunae in the courtyard of the farm and production section of the villa in Verige Bay

zija kao i tri plitka kamena bazena, postavljena u nizu ispred njih (sl. 7). Pod dvorišta bio je izveden u *opus spicatumu*, čak i odvodni kanali izvedeni su vrlo pravilno u istoj tehnici. Od reda kamenih korita vodi plitki žlijeb od opeka, umetnut u pod od opeka koji kod posljednjeg korita zavija i ide u padu prema obali (sl. 8). Pod pokazuje prostor u kojemu se radilo s većom količinom vode, jer je izveden od spika u hidrauličnom mortu posebno otporan na vlagu i vodu (sl. 9).

Bočno od velikog dvorišta bile su prostrane prostorije s pragovima još očuvanim *in situ*. Bočni portici djelomično su očuvani, ali njihovu dužinu nije bilo moguće ustanoviti. Na čeonoj strani zgrade (južnoj) prema moru nađeni su samo zidovi prostorija koje su se nalazile u razini ispod opisanog dvorišta. Ispred objekta nalazi se građena obala, a bočno prema istoku teretni mol i pristanište.

Postavlja se pitanje datacije novoizgrađenog dijela vile. Oblikovno je sličan zgradi s vanjskim porticima na sjevernom dijelu Dioklecijanove palače i može se promišljati o izgradnji u razdoblju Dioklecijanove vladavine. M. Suić je tu dogradnju povezao s razdobljem nakon Konstantina, kada terme gube svoju prvobitnu funkciju i mogu postati dio proizvodnog pogona. U svakom slučaju, gubitkom reprezentativne uloge vile i terme gube na svom značaju (Begović, Schrunk 2004, 68-69). Zgrada s vanjskim portikatima i prostranim unutarnjim dvorištem s ostacima kamenih recipijenata te kanalima za odvodnju, na Brijunima u uvali Verige bila je interpolirana na položaju između terma i gospodarskog dijela (iz 1. st.). S istočne strane objekta uz more izgrađeni su redovi skladišta neposredno uz teretni mol.

Iznad pristaništa, koje se danas nalazi ispod razine mora, istraženi su redovi prostorija koje vjerojatno predstavljaju skladišta. Između zgrade s vanjskim porticima i skladišta u razini za jedan kat povišeno iznad skladišta, istražen je portik s pravokutnim eksedrama poda popločenog jednostavnim bijelim mozaikom. Također, u svom sastavu ova zgrada ima nekoliko većih prostorija i jednu malu cisternu poda popločenog bijelim mozaikom (izduženih pravokutnih kockica), (sl. 10). Mogla bi predstavljati prostorije iz kojih se mogao nadgledati



Sl. 7 Kamene *lacunae* u dvorištu zgrade s vanjskim portikatima i nacrt *lacuna* (Begović Dvoržak 2004)

Fig. 7 Stone lacunae in the courtyard of the building with external porticos and ground plan of the lacuna (Begović Dvoržak 2004)

ter the construction of the maritime villa in the 1st century. The *fullonica* was interpolated later and it lay over one part of the previously existing structures. The floor bricks – the floor was made in *opus spicatum* – are of different dimensions from those in the villa's residential quarters that were built in the 1st century (Begović, Schrunk 1999, 433). The size of the floor bricks in the newly constructed part is 10.5 x 1.8 cm, whereas the floor bricks in the residential quarters are 11.7 x 2.2 cm. This later construction in Verige Bay was interpolated between the luxurious *thermae* (dating from the second half of the 1st century) and the farm buildings. The shape and positioning of this construction, as well as the different dimensions of material used, reveal that it emerged later (Fig. 6). This interpolated part of the villa was researched in 1977

Sl. 9 Tlocrt i nacrt četvrtastih bazena (Gnirs 1915, Bezeczky 1998)

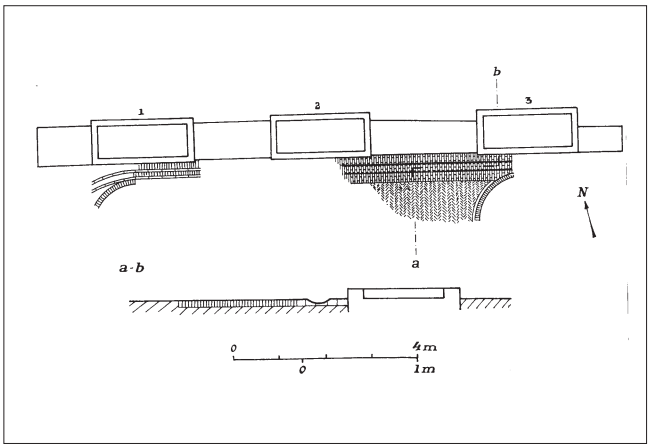


Fig. 9 Ground plan and plan of rectangular pools (Gnirs 1915, Bezeczky 1998)

utovar i istovar robe, s obzirom da ima dobar pogled na mol i pristanište. Taj dio bio je spojen malim stubištem s obalom i pristaništem.

Cesta građena uz morsku obalu krajem 19. st. presjekla je gospodarski dio maritimne vile u dva dijela, tako da su danas uočljive dvije cjeline.

Sl. 8 Odvodni kanali izvedeni u tehnici *opus spicatum* u podu dvorišta

Fig. 8 Drainage ditches made in opus spicatum in the paving of the courtyard

by A. Vitasović, while in 1986 M. Jurišić and M. Orlić led the excavations of the warehouses next to the cargo wharf. Another newly erected structure was a building surrounded with porticos. Sixty metres of the portico (4.13 m wide) on the northern side of the building have been preserved. From the portico and over two stone steps, it was possible to enter a large courtyard (17 m x 10 m). In it, two excellently preserved stone *lacunae* were discovered (with a diameter of 2 m), as well as two *lacuna* bases of the same dimensions and three shallow stone pools placed in front of them (Fig. 7). The surface of the courtyard was made in *opus spicatum*. Even the drainage canals were made in the same technique, with a very regular pattern. They consisted of lined-up stone troughs and a shallow brick ditch, which turned at the last trough and descended towards the sea (Fig. 8). The surface, paved with bricks placed in hydraulic mortar, indicates that large quantities of water were used in this section of the villa, because such paving is highly resistant to humidity and water (Fig. 9).

Next to the large courtyard there were two spacious rooms with thresholds that have been preserved *in situ*. Some parts of the lateral porticos have been preserved, but it is impossible to establish their length. In the section of the building that faces the sea (the southern side), only the partition walls of the rooms that were under the level of the courtyard have been found. In front of the building there was a man-made waterfront, with a cargo wharf and landing pier further towards the east.

The question remains about when this new portion of the villa was built. Its design is similar to that of the building with external porticos in the northern section of Diocletian's palace, and it can be assumed that it was constructed during the reign of Diocletian. M. Suić believed that the extension was built after Constantine, at the time when the *thermae* lost their original function and could thus be turned into a production facility. In any case, having lost their representative function, the *thermae* lost their significance (Begović, Schrunk 2004, 68-69). The building with external porticos and large internal courtyard with the remnants of stone vessels and drainage ditches in Verige Bay on the Brijuni Islands was interpolated between the *thermae* and the farm buildings (dating from the

Sl. 10 Mala cisterna poda popločenog bijelim mozaikom

Fig. 10 Small cistern paved with white mosaic

Za pogone *fullonicae* bilo je vrlo važno obilje vode potrebno za ispiranje tkanina. Gospodarski dio vile bio je povezan akveduktom koji je dovodio vodu s izvora na brdu Gradina, što je osiguravalo dovoljnu količinu vode za ispiranje u procesu pranja, izbjeljivanja i bojanja tkanina.

Obilan izvor pitke vode nalazio se u ponoru dubokom 20 m, usječenom u stijeni na istočnoj padini brda Gradina. Bunar, iz kojeg se crpila voda, nalazio se na 18 m nadmorske visine u blizini vanjskog ruba histarske gradine. Naprave kojima se crpila voda iz tako dubokih bunara opisao je Vitruvije (Vitr., IX, 5). Iznad izvora izgrađen je nimfej. Neposredno uz izvor izgrađene su u 1. st. dvije velike vodospreme, građene u tehnici *opus caementicium,* s vanjske strane učvršćene od pritiska vodene mase zidom od lomljenog kamena u mortu (sl. 11). Dno vodosprema opločeno je okomito postavljenim opekama u tehnici *opus spicatum* kojima se pripisuje naročita izdržljivost i otpornost na vodu. Vodospreme su najvjerojatnije bile pokrivene bačvastim svodom. Prva vodosprema, dimenzija 14,78 x 2,4 m i dubine 2,4 m, opskrbljivala je rezidencijalni dio maritimne vile. Druga vodosprema, dimenzija 14,1 x 2,66 m i dubine 2,4 m, opskrbljivala je vodom terme i gospodarski dio maritimne vile. Bila je spojena malim akveduktom cijevima koje su se nalazile na stupovima iznad terena. Obzidana ležišta za stupove vidljiva su i danas na istočnoj padini brda Gradina. Antički akvedukti, kao što je opisao B. Ilakovac, bili su isključivo gravitacijski (Ilakovac 1976, 113). Iz tog razloga akvedukt koji je išao s brda Gradina zbog svog relativno strmog pada morao je biti izveden zavojito (u cik cak rasporedu) da bi se na relativno maloj udaljenosti svladala velika visinska razlika i da se brzina toka vode uspori. Vođenje cijevi spiralno usporavalo je tok vode. Bazeni terma bili su tako punjeni vodom, a frigidarij je imao i posebni izljev koji je dovodio vodu u bazen u obliku malog vodopada. Voda se u termama zagrijavala u ložištima (*praefurnium*) koja su bila smještena u substrukcijama (sl. 12). Iz ložišta vodena para cirkulirala je prostorom hipokausta i zagrijavala podove terma (sl. 13). Potrošač vode bila je i *piscina vivaria* ispred termalnog kompleksa, u kojoj se veliki salinitet (zbog isparavanja) morao

1st century). To the east of it, rows of warehouses were constructed in the immediate vicinity of the cargo wharf.

Above the landing pier that is now submerged in the sea, rows of buildings – probably warehouses – have been examined. Archaeologists have also studied the portico with rectangular *exedrae*, paved with simple white mosaic, situated between the building with external porticos and the warehouses, at a level one storey higher than that of the warehouses. This building consisted of several large rooms and a small cistern covered in white mosaic made of long rectangular tesserae (Fig. 10). These rooms could have been used to monitor the loading and offloading of cargo, since it offers a good view of the wharf and the pier. This section was also connected with the waterfront and landing pier by a small flight of steps.

The road that was built along the waterfront in the 19th century cut the farm and production facilities of the villa into two parts, so that nowadays they stand as two distinct units.

The *fullonica* installations required a great quantity of water, since the cloth needed to be rinsed. Therefore, an aqueduct brought water to the production buildings of the villa from water sources on Gradina hill, which secured sufficient water for rinsing in the process of washing, bleaching and dyeing of cloth.

An abundant source of potable water existed in a 20 m deep gorge cut into the rock on the eastern side of Gradina hill. The well from which water was pumped was situated 18 m above sea level, in the vicinity of the outer edge of the Histrian hillfort. The equipment used to pump water from such deep wells was described by Vitruvius (Vitr., IX, 5). Above the water source, the Romans built a nimpheum. In the 1st century, two large water tanks were constructed in the immediate vicinity, in *opus caementicium,* with a supporting wall of crushed stone in mortar on the outer side to protect the tanks from the water pressure (Fig. 11). The water tanks were tiled with vertically placed bricks using an *opus spicatum* technique which was considered particularly strong and water resistant. The water tanks were probably covered with a barrel vault. The first tank has the dimensions of 14.78 x 2.4 m and is 2.4 m deep. It provided water for the residential quarters of the maritime villa. The second tank, 14.1 x 2.66 m in size and 2.4 m deep, supplied water to the baths and farm and to the production buildings. The water passed through a small aqueduct that consisted of pipes raised above the ground on pillars. The brick-covered pillar footings are still visible on the eastern slope of Gradina hill. The Roman aqueducts, as described by B. Ilakovac, relied only on gravity (Ilakovac 1976, 113). For this reason, the aqueduct that started on Gradina hill, which is relatively steep, had to zigzag downhill, to avoid the water flowing too quickly. The spiralling of the pipes slowed the water down. The pools in the *thermae* were filled in this way, while the *frigidarium* had a special outflow that looked like a small cascade. The water was heated by furnaces (*praefurnium*) placed under the structures (Fig. 12). The steam circulated from the furnaces through the hypocaust and heated the floors (Fig. 13). The water was also used for the *piscina vivaria* in front of the *thermae*, which needed the influx of fresh water in order to keep down the salinity (caused by evaporation). At the time when the *thermae* lost

Sl. 11 Nimfej i vodospreme na brdu Gradina iznad zaljeva Verige

Fig. 11 Nimpheum and water tanks on Gradina hill above Verige Bay

Sl. 12 Svodovi ložišta (*praefurnium*) u substrukcijama terma, danas vidljivi na obali

Fig. 12 Furnace (praefurnium) vaults in the thermae understructure, nowadays visible on the waterfront

ublažavati dodavanjem slatke vode. U vrijeme kada terme gube svoju reprezentativnu ulogu, uz njih se izgrađuje novi objekt s velikim posudama (*lacunae)* u središnjem dvorištu - u njih su smješteni pogoni *fullonicae* (sl. 14). Njezin smještaj uz bazene terma je logičan jer je mogla koristiti već postojeći akvedukt i ložišta za zagrijavanje vode potrebne u procesu pranja i ispiranja tkanina.

Socijalni i ekonomski kontekst u kojem se vila razvila povezuje taj posjed s rimskom senatorskom obitelji *Laecanii* koji su posjedovali figlinu u Fažani, te posjed na sjeveru Istre u Materiji (Šonje 1991, 35). Već u 1. st. njihovi posjedi su uključivali planinske pašnjake pogodne za uzgoj ovaca i plodna zemljišta uz morsku obalu na kojima su izgrađene vile.

Također, arheološki nalazi ostataka bazena solana i toponim Soline govore o eksploataciji soli na Brijunima, a jedini pisani dokument potječe iz 543. g. u kojem se spominje da je biskup Eufrazije darovao trećinu brijunskih solana svome kleru (Zaninović 1991, 259).

Tijekom 2. i 3. st. mijenja se gospodarstvo Brijuna. Privreda je tada bazirana na značajnim pogonima *fullonicae,* što ih bilježi *Notitia dignitatum* četrdesetih godina 5. st. (Suić 1987, 201).

Fullonicae prema ukazu *Edictum Diocletiani de pretiis rerum venalium* (Dioklecijanov ukaz o cijenama) bili su manufakturni pogoni za završnu obradu vunenih tkanina. Završna obrada tkanina je složeni proces koji se sastoji od niza postupaka kao što je pranje, izbjeljivanje, bojenje, sušenje, grebenanje, izvedba glatke ili dlakave gornje površine, te prešanje (za izgled glatke tkanine ili nabora). To su složeni mehanički i kemijski procesi. Posebno je ekonomski isplativ bio posao bojanja tkanina purpurom. Procjenjuje se da je vrijednost 1 kg purpura bila jednaka vrijednosti 1 kg zlata. Tkanine su bile tretirane *de tela* i *ab usu,* izrazi koji se izvode iz Dioklecijanova Edikta iz 301. g. (Bradley 2002, 21). Dioklecijanov Edikt utvrdio je najviše cijene koje radnici u fulonici mogu zahtijevati za određeni stupanj obrade tkanina, od kojih je svaka opisana kao *rudis*. Vuna je sadržavala veliku količinu masnoće i prvo je bilo potrebno temeljito pranje, sa sredstvima za odmašćivanje, za koji proces je trebala velika količina vode. Nakon toga tkanina je prolazila niz završnih postupaka koje

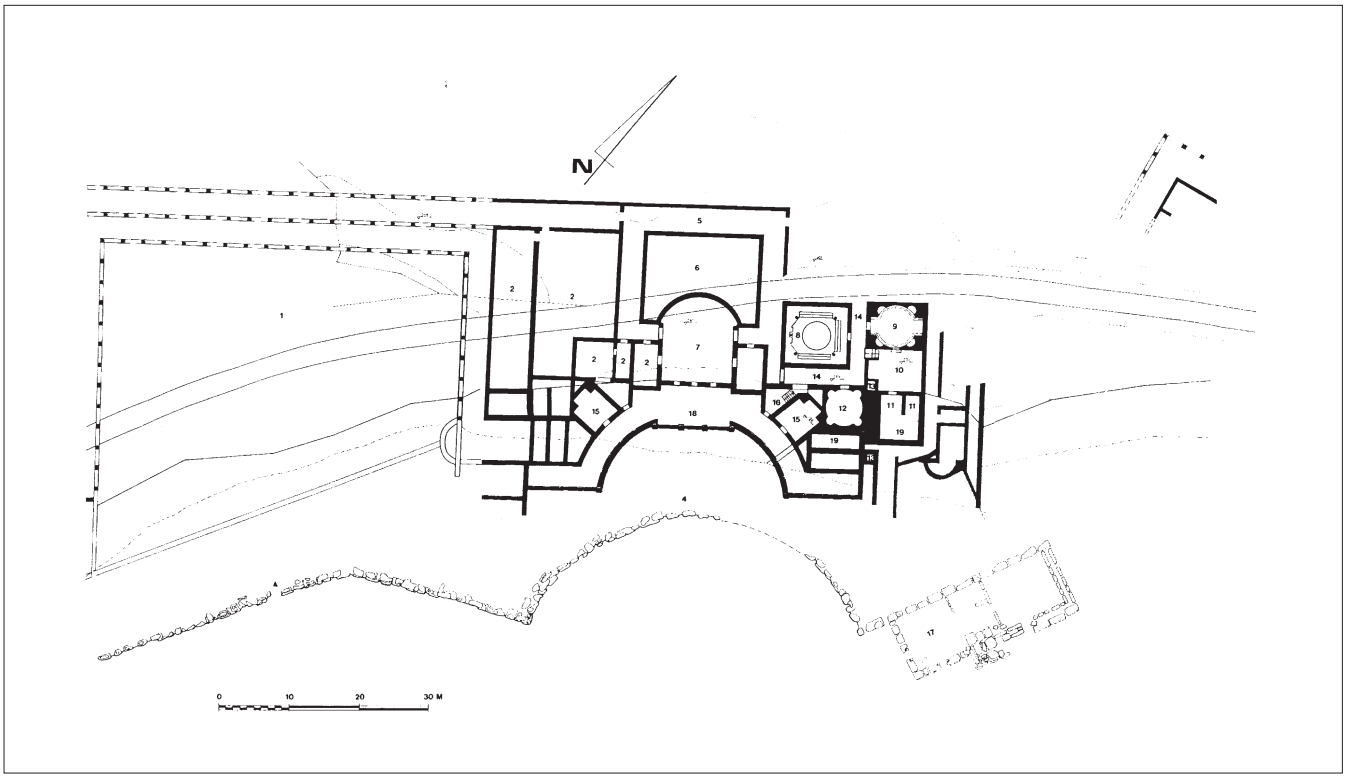
their representative function, a new structure was built next to them, with large vessels (*lacunae)* in the central courtyard. The new structure housed the *fullonica* installations (Fig. 14). The positioning of the *fullonica* next to the baths is logical, because it enabled the use of the already existing aqueduct and water-heating furnaces necessary for the washing and rinsing of cloth.

The social and economic context in which the villa emerged links this estate to the Laecanii family of Roman Senate members who owned a *figlina* in Fažana and another estate in Materija in northern Istria (Šonje 1991, 35). As early as in the 1st century, their property included mountain pastures suitable for raising sheep, and fertile plots of land by the sea that were used for the construction of villas.

Archaeological finds of remains of salt pans and the very name of the place, Soline, testify to the exploitation of salt on the Brijuni. The only written document to confirm this dates from 543. It is a deed of donation whereby Bishop Euphrasius gave one third of the Brijuni salt works to his clerics (Zaninović 1991, 259).

During the 2nd and 3rd centuries, the economic activities on the Brijuni changed. The economy now relied on the important activity of the *fullonicae,* noted also in *Notitia dignitatum* in the 440s (Suić 1987, 201).

According to the decree *Edictum Diocletiani de pretiis rerum venalium* (Diocletian's Decree on Prices), the *fullonicae* were workshops where the final processing of woollen cloth was undertaken. This is a complex process that includes a range of activities such as washing, bleaching, drying, combing, making a smooth or furry upper surface, and pressing (to make it smooth or pleated). These are all complex mechanical and chemical processes. An especially lucrative activity was dyeing the cloth purple. It is estimated that the value of 1 kg of purple was equal to the value of 1 kg of gold. The cloth was treated *de tela* and *ab usu,* both terms deduced from Diocletian's Decree of 301 A.D. (Bradley 2002, 21). That Decree established the highest prices that *fullonicae* operators could ask for a particular level of cloth processing. Each of these levels was described as a *rudis*. Wool contained a high portion



Sl. 13 Maritimna vila - terme - tlocrt (Begović Dvoržak 1997) 1. palestra; 2. prostorije za vježbanje; 3. portik; 4. građena obala; 5. eksedra; 6. dvorište; 7. središnja dvorana s apsidom; 8. *frigidarium*; 9. *tepidarium*; 10. *apoditerium*; 11. *caldarium*; 12. *sudatio*; 13. dimnjak; 14. hodnik; 15. prostorije za odmor; 16. stubište; 17. *piscina vivaria*; 18. polukružni portik; 19. *praefurnium*

Fig. 13 Maritime villa - thermae – ground plan (Begović Dvoržak 1997) 1. pallaestra, 2. rooms for physical exercise; 3. portico; 4. stone-built waterfront; 5. exedra; 6. courtyard; 7. central hall with an apse; 8. frigidarium; 9. tepidarium; 10. apoditerium; 11. caldarium; 12. sudatio; 13. chimney; 14. corridor; 15. resting rooms; 16. steps; 17. piscina vivaria; 18. semi-circular portico; 19. praefurnium

su uključivale češljanje, izbjeljivanje, bojenje i peglanje. Specifikacija *rudis* u ukazu Edictum Diocletiani ovisi o činjenici jesu li tkanine već bile rabljene i obrađivane. Obrada nove vune bio je zahtjevniji proces, nego vune koja je već prošla taj tretman. Kvaliteta završne obrade tkanina i njihova boja (pogotovo bjelina) bila je od posebne važnosti. Rimljani su bili obuzeti željom da izgledaju čisto. Elegantni i dostojanstveni rimski građanin težio je da uvijek izgleda čisto. Politički kandidati morali su imati posebno sjajne bijele toge (*toga candida* - Plin. *Nat. hist*. 35. 175). *Fullonicae* su imale isti zadatak kao i terme, institucija zdravlja i čistoće (Bradley 2002, 23). *Fullonicae* su uglavnom radile s vunom, ali ima naznaka da su i druge tkanine, osim vunenih, bile tretirane u fulonikama. Proces je bio takav da su tkanine ili odjevni predmeti bili prvo čišćeni, gaženi, gnječeni u posudama (*lacunae)* ili u drvenim koritima (*pilae fullonicae)* s vrućom vodom i nekim od sredstva za pranje. Taj je proces mogao trajati do tri dana. Postupak je služio da sredstva za čišćenje prodru u tkaninu, a kao sredstva za pranje upotrebljavani su *nitrum* (potaša), sapun, urin i pročišćena glina - *creta fullonica* (Suić 1987, 201). *Creta fullonica* imala je u svom sastavu kalcijeve minerale s jakom komponentom za topljenje masnoća (Bradley 2002, 24). Nakon intenzivnog pranja tkanine ili odjeća su se temeljito ispirali vodom i tukli da se učvrsti tekstura. Nakon toga su se vješale na drvene grede i sušile na zraku, sve dok nisu bile potpuno suhe. Nakon toga tkanina se vješala na motke i

of fat and first needed to be thoroughly washed with defattening agents. This process required large quantities of water. After the washing, the cloth went through a range of finishing treatments that included combing, bleaching, dyeing and pressing. The *rudis* specification in the Edictum Diocletiani Decree depended on whether the cloth had previously been used or treated. The processing of fresh wool is much more demanding than treating wool that had already been processed. The quality of the finish and the cloth colour (especially if white) were particularly important. The Romans were obsessed with the desire to look clean. The elegant and dignified Roman citizen always wanted to look spruce. Candidates for political office had to have especially bright white togas (*toga candida* - Plin. *Nat. hist*. 35. 175). The *fullonicae* played a role similar to that of the *thermae* – they were institutions that guaranteed health and cleanliness (Bradley 2002, 23). The *fullonicae* mostly processed wool, but there are indications that other kinds of cloth were also treated there. The cloth or pieces of clothing were firstly cleaned, and then trodden on, crushed in *lacunae* or in wooden troughs (*pilae fullonicae)*, immersed in hot water and some washing agent. This process could take up to three days and its purpose was for the washing agent to penetrate into the cloth. The washing agents applied by the Romans included *nitrum* (potash), soap, urine, and purified clay (*creta fullonica)* (Suić 1987, 201). The *creta fullonica* is composed, among other things, of calcium minerals that

Sl. 14 *Fullonica* u uvali Verige – pogled s istoka

Fig. 14 Fullonica in Verige Bay – view from the east

grebenala s četkama na čičak da se postigne mekana, pahuljasta površina ili gruba, dlakava (ovisno o kasnijoj namjeni). Dlakava površina bila je kasnije šišana velikim škarama da se dobije jednolični izgled. Tkanine koje je trebalo izbjeliti bile su rastegnute preko zaobljenih ili pravokutnih pletenih okvira (v*iminea cavea*), ispod kojih je bio zapaljen sumpor (sumporni sulfat). Upotrebu sumpornih para opisuje Plinije Stariji (Plin. *Nat*. *hist*. 35. 175) - *candido fumo*. Nakon toga tkanine su bile trljane glinom za čišćenje (*desquamare*). Različite vrste gline bile su korištene za različite efekte na različitim vrstama tkanina. Tkanine koje su bile predviđene za bojanje tretirale su se s različitim dodacima za boje od kojih je najpoznatiji purpur. Završni stupanj (*pulire vestimenta*) uključivao je ponovno češljanje i šišanje gornje strane tkanine i pritiskivanje upotrebom posebnih preša (*prelum* ili *pressorum)* za izradu glatke ili nabrane tkanine. Nabori na tkaninama i odjeći ovisili su o modnim zahtjevima. Takvi pogoni *fullonicae* nađeni su u Ostiji, Pompejima i Herculaneumu (Bradley 2002, 24). *Fulonicae* i njihovi radnici bili su pod zaštitom Minerve, kao božanske zaštitnice posebnih vještina i obrta.

Velike posude za pranje, stupanje i gaženje tkanina (kameni recipijenti) prva su indikacija za postojanje fulonika. Prema ovim opisima pogona *fullonicae* i posebno opisima velikih posuda za pranje, arheološke ostatke na gospodarskom dijelu vile u uvali Verige može se neupitno označiti kao pogone *fullonicae* (De Franceschini 1998, 625-626). Postojanje obilnog izvora vode i akvedukta koji je vodio s brda Gradina u terme i na gospodarski dio vile, ispunjene su one najvažnije pretpostavke za takve pogone. Blizina terma s kotlovima za toplu vodu koja je nužna u procesu pranja, bila je razlogom smještaja pogona *fullonicae* upravo u taj dio vile. Nalazi mljevenih školjaka *murex* (volak) s nedalekog kopna kod Barbarige upućuju na bojanje tkanina purpurnom bojom. Boje za tkanine dobivale su se od 6 tipova školjaka, a bojanje se izvodilo u različite nijanse purpurne boje sve do duboke nebesko plave boje. Fulonike su bile uz more, jer im je trebala morska voda za stabilizaciju boje. Pod izveden u tehnici *opus spicatum* u fulonici na Verigama govori o prostorijama u kojima se radilo s vodom (prostorije za pranje). U istoj tehnici *opus spicatum* izvedeni su i odvodni kanali u dvorištu. Velike posude za pranje, stupanje i gaženje tkanina (kameni recipijenti) prva su indikacija za postojanje fulonika. Prema ovim opisima pogona *fullonicae* i posebno opisima velikih posuda za pranje, arheološke ostatke na gospodarskom dijelu vile u uvali Verige može se neupitno označiti kao pogone *fullonicae* (De Franceschini 1998, 625-626). Postojanje obilnog izvora vode i akvedukta koji je vodio s brda Gradina u terme i na gospodarski dio vile, ispunjene su one najvažnije pretpostavke za takve pogone. Blizina terma s kotlovima za toplu vodu koja je nužna u procesu pranja, bila je razlogom smještaja pogona *fullonicae* upravo u taj dio vile. Nalazi mljevenih školjaka *murex* (volak) s nedalekog kopna kod Barbarige upućuju na bojanje tkanina purpurnom bojom. Boje za tkanine dobivale su se od 6 tipova školjaka, a bojanje se izvodilo u različite nijanse purpurne boje sve do duboke nebesko plave boje. Fulonike su bile uz more, jer im je trebala morska voda za stabilizaciju boje. Pod izveden u tehnici *opus spicatum* u fulonici na Verigama govori o prostorijama u kojima se radilo s vodom (prostorije za pranje). U istoj tehnici *opus spicatum* izvedeni su i odvodni kanali u dvorištu. Velike posude have a high defattening capacity (Bradley 2002, 24). After the intensive washing, cloth or clothes were thoroughly rinsed and then beaten to strengthen their texture. Following this, they were hung over wooden beams and dried, until completely dry. The next step was combing or brushing to make the surface soft and fluffy, or rough and furry (depending on the intended use). The furry surfaces were later trimmed with big scissors. The cloth that had to be bleached would be stretched over wicker frames (*viminea cavea*), and sulphur (sulphur sulphate) would be lit underneath. The use of sulphur fumes (*candido fumo)* was described by Pliny the Elder (Plin. *Nat*. *hist*. 35. 175). Afterwards, the cloth was rubbed with cleaning clay (*desquamare*). Different types of clay produced different effects on different kinds of cloth. The cloth that was meant to be dyed was treated with various dying additives, purple being the most famous. The final stage (*pulire vestimenta*) included yet another round of combing and trimming, and pressing in specially designed presses (*prelum* or *pressorum)* which produced either smooth or pleated cloth. The pleats and folds on the cloth and clothing depended on the fashion requirements.

These types of *fullonicae* have been discovered in Ostia, Pompeii and Herculaneum (Bradley 2002, 24). The *fullonicae* and their operators were protected by Minerva, the patron goddess of special skills and crafts.

Large vessels for washing and treading of cloth (stone recipients) are always the first indication that a *fullonica* was present in a certain location. On the basis of the available descriptions of the *fullonica* installations and especially on the basis of descriptions of large washing vessels, the archaeological remains in the farm and production section of the villa in Verige Bay may be convincingly described as *fullonica* installations (De Franceschini 1998, 625-626). The presence of a water source and the aqueduct that brought water from Gradina hill to the baths fulfilled the most important preconditions for the operation of such an installation. The vicinity of the baths which contained furnaces for warm water, necessary for washing, lead to the construction of the *fullonica* in this particular portion of the villa. The finding of ground murex shell, originating from the nearby shore in the vicinity of Barbariga, indicates that the cloth was dyed purple in this location. Dyes were produced from six types of molluscs, and the cloth was mostly dyed purple, with different nuances, all the way to a deep sky blue colour. The *fullonicae* were situated by the sea, because they used sea water to stabilize dyes. The paving in *opus spicatum* technique in the Verige *fullonica* proves that water was used in that particular room (washing room). The drainage ditch in the yard was made in the same technique. Large vessels for washing and rinsing (*lacunae*) were located next to one another, with pipes placed above them. The pipes were connected to the aqueduct and there was a tap at the end of each of them. In front of the stone vessels there were rectangular stone pools in which the cloth was additionally treated or just wrought out. In those pools the cloth would be immersed in hot water which would make it loose its visible seams and acquire felt-like texture. The shallow pools were also used for treading and wringing of the cloth. The external porticos may have

sude namijenjene za pranje i ispiranje (*lacunae*) bile su postavljene u nizu i opskrbljene cijevima iznad njih. Cijevi su bile spojene na akvedukt i na kraju su imale slavinu. Ispred kamenih posuda nalaze se četvrtasti kameni bazeni poredani u nizu u koje su se tkanine stavljale na dodatnu obradu ili samo cijeđenje. U tim bazenina u vrućoj vodi tkanine su gubile vidljive spojnice od pletenja i postajale su nalik na pust ili filc. Plitki bazeni služili su također za gaženje i cijeđenje tkanina da bi se istisnula suvišna boja. Možda su i portici na vanjskoj strani objekta služili za sušenje tkanina. Osiguravali su dobro prozračivanje i bili zaklonjeni od sunca i kiše.

Pogone za završnu obradu tkanina - grebenanje, češljanje, šišanje i prešanje (da se dobije glatka površina ili s naborima) prepoznajemo u arheološkim ostacima u dvorištu vile u uvali Madona (Suić 1987, 203; Matijašić 1999, 241-251) Nađeni su ostaci preluma za istiskivanje viška tekućine iz tkanina, te završnu obradu tkanina pritiskivanjem upotrebom preša za izradu glatke ili nabrane tkanine (s naborima). M. Verzàr Bass pretpostavlja da su pogoni u uvali Verige i u uvali Madona dijelovi istog proizvodnog procesa (Verzàr Bass 1989, 656).

Na oba lokaliteta korišteni su djelomično već postojeći građevinski sklopovi rimskih vila, a djelomično su izgrađeni novi. Dograđivanje zgrade s vanjskim porticima uz terme u zaljevu Verige i dograđivanje objekta za smještaj nadglednika, te izgradnje skromnih stambenih prostora za radnike (*fullones*) u uvali Madona bile su potrebne adaptacije koje su izvršene u već postojećim sklopovima. Završna obrada i bojanje tkanina moralo je biti visokostandardizirano, sistematizirano i organizirano, znači pod nadzorom visokih državnih službenika *procuratora.* Smještaj nadglednika neposredno uz pogone bio je iznimno važan zbog nadzora proizvodnje, pa takve sadržaje možemo pretpostaviti na rezidencijalnom dijelu vile u uvali Verige. Kvaliteta gotovih proizvoda bila je pod državnim protektoratom i jamstvom, tako je važna da je bila opisana u *Edictum Diocletiani*. Vunene tkanine su također strateški važni proizvodi za opskrbu rimske vojske. Arhitektonski ostaci u uvali Verige pokazuju sliku radioničkog pogona za koji su bili korišteni prostori maritimne vile iz 1. st. Smještaj radne snage (*fullones*) mogao je biti u zgradi na jugoistočnom obronku brda Mrtvi vrh, ali i na drugim dijelovima vile koja je izgubila svoju reprezentativnu ulogu. Moguće je uočiti promjene u korištenju nekad luksuznih dijelova vile. Npr., nalaz mnogobrojnih ulomaka amfora i keramičkog posuđa na području prostorija uz veliki portik (*diaeta* u sastavu koje je polukružna prostorija s polihromnim mozaikom) govori u prilog da su ti, u početku vrlo reprezentativni, prostori bili kasnije korišteni kao skladišta. Slično restrukturiranje i prenamjene prostora opisane su u maritimnoj vili na Loronu (Kovačić, Marchiori, Rosada, Tassaux, Carre 2004, 248). Slične adaptacije mogle su se događati i na drugim dijelovima vile u uvali Verige. Takve prenamjene na maritimnim vilama u kasnoj antici opisuje i M. Verzàr Bass (Verzàr Bass 1986, 655-657). Datacijom *fullonicae* na Brijunima bavio se posebno M. Suić koji fuloniku povezuje s *Bafium Cissense Venetiae et Histriae* koga bilježi *Notitia dignitatum* (nastala oko 435. g.), te to smatra *terminus ante quem* za gradnju *fullonicae* (Suić 1987, 204).

been used for drying. They were well aired and sheltered from sunshine and rain.

The archaeological remains in the courtyard of the villa in Madona Bay have been recognised as installations for the final treatment of the cloth – scraping, combing, trimming and pressing (Suić 1987, 203; Matijašić 1999, 241-251). Fragments of a *praelum* were also found. It was used to extract surplus liquid from the cloth and to press the cloth to make it smooth or pleated. M. Verzàr Bass suggested that installations in Verige Bay and those in Madona Bay may have been parts of the same production process (Verzàr Bass 1989, 656).

At both sites the installations were partly placed in the existing facilities of the Roman villa, and partly in the newly constructed buildings. The necessary modifications of the previously built facilities included an extension of the building with external porticos located by the baths in Verige Bay and an extension of the building to accommodate supervisors. Modest workers (*fullones*) quarters were also built in Madona Bay. The final treatment and dyeing of cloth had to be highly standardised, systematic and well-organised; in other words, supervised by high officials of the state, *procurators.* The fact that the supervisors were accommodated in the immediate vicinity of the *fullonica* installations was very important from the point of view of production surveillance. The quality of final products was protected and guaranteed by the state, and it was considered to be so important that it was described in *Edictum Diocletiani*. Woollen cloth was a strategically important product for the Roman army. The architectural remains in Verige Bay reflect the layout of the workshops within the maritime villa from the 1st century. Workers (*fullones*) may have lived in the building on the south-eastern slope of Mrtvi Vrh hill, but also in other sections of the villa which had lost its representative function. The new usage of the previously luxurious portions of the villa is easily observed. For example, numerous amphora and pottery fragments that have been discovered in the rooms by the large portico (the *diaeta* which includes a semi-circular room with polichrome mosaic) indicate that these representative chambers were later used as storage facilities. A similar reconstruction and conversion of the facility occurred in the maritime villa in Loron (Kovačić, Marchiori, Rosada, Tassaux, Carre 2004, 248). Such modifications could have been made in other sections of the villa in Verige Bay as well. The conversion of villas in late antiquity was also described by M. Verzàr Bass (Verzàr Bass 1986, 655-657). The dating of the Brijuni *fullonica* was a particular interest of M. Suić who linked it to *Bafium Cissense Venetiae et Histriae* recorded in *Notitia dignitatum* (drafted around 435 A.D.). He considered it a *terminus ante quem* for the construction of the *fullonica* (Suić 1987, 204).

At the Punta Cissana site or at Punta Barbariga on the mainland, in 1902 Schwalb discovered ground murex shell which yields purple colour. He also described similar stone vessels which he had discovered in Colone Bay (Schwalb 1902, 3-6). The Gnirs's description of the villa in St. Nicholas Bay on Mali Brijun Island also gives an account of the facilities for cloth treatment (Gnirs 1901, 130). All this brings one to the assumption that the Brijuni villa and the site in the

Na lokalitetu Punta Cissana ili Punta Barbariga na kopnu Schwalb je 1902. g. ustanovio nalaz mljevenih školjaka tipa volak od koje se dobiva purpur, a u uvali Colone donosi sliku i opisuje nalaz sličnih kamenih recipijenata (Schwalb 1902, 3-6). Gnirsov opis vile u uvali sv. Nikole na Malom Brijunu također govori o proizvodnim pogonima za obradu tkanina (Gnirs 1901, 130), pa bi tako vile na Brijunima i oko Barbarige bile dio povezanoga proizvodnog pogona, što su zaključile M. Verzàr Bass i M. De Franceschini (Verzàr Bass 1989, 656; De Franceschini 1998, 649).

Istraživanja 1992. g. na vili na lokalitetu Fornače, južno od Pirana, rezultirala su nalazom zida maritimne vile iz 1. st., građenog u tehnici *opus reticulatum*, ali i nalazom kasnijih zidova (preinake na vili) izvedenih u tehnici *opus incertum*. U šuti između ta dva zida nađeno je mnoštvo ljuštura školjaka tipa *murex* i kućica morskih puževa, što ukazuje na moguće pogone fulonike (Stokin 1992, 80).

Prema ovim primjerima u kasnoj antici na vilama uz zapadnu obalu Istre isti prostori s drukčijom namjenom ukazuju na drukčiju upotrebu različitih dijelova vila, te izgradnju novih objekata, potrebnih za funkcioniranje proizvodnih pogona koji se smještaju u maritimne vile. U podmorju vile u uvali Verige najbrojniji su upravo hidroarheološki nalazi iz 4., 5. i 6. st., nađeni ispred gospodarskog dijela (Jurišić, Orlić 1987, 98-99).

Tijekom 2. i 3. st. dogodile su se promjene u gospodarstvu Istre. Nagli rast gradova uzrokovao je smanjenje broja žitelja na izvangradskim ekonomijama. Nakon razdoblja stagnacije, kada se pogotovo rezidencijalni dijelovi vile zapuštaju, preostali prostori vile prenamijenjeni su za neku drugu ulogu koja može osigurati ekonomsku bazu i pridonijeti opstanku vile. U takvoj situaciji događaju se zgrade pogona *fullonicae* na maritimnim vilama u Istri, posebno i radi povoljnih uvjeta za takvu proizvodnju (stočarstvo na planinskim područjima Istre, proizvodnja vune, prirodni izvori sumpora i prirodna nalazišta školjaka, od kojih se dobivao purpur). Pojedini prostori vila adaptirani su za novu namjenu, a grade se i novi objekti unutar dvorišta ili na postojećim sklopovima. Vile su u kasnoj antici bile organizirane kao manja naselja sa svim potrebnim sadržajima za rad i boravak većeg broja ljudi. Na maritimnoj vili u uvali Verige ustanovljeno je preuređenje velike dvorane s apsidom na termama u kršćansku crkvu, a bazen frigidarija uz dvoranu preuređen je u baptisterij. Veliki portik (*porticus miliaria*) i kriptoportik, te prostorije neposredno uz njih, bili su prenamijenjene u skladišne prostore. U luci dodatno se grade redovi skladišta uz teretni mol.

Fulonike na području Istre dobro su organizirane, specijalizirane za pojedine dijelove tog složenog procesa i kreirale su ekonomiju velikog mjerila kao dio sjevernoitalskih fuloničkih radionica i trgovina suknom, s glavnim središtem i glavnom izvoznom lukom u Akvileji.

vicinity of Barbariga were parts of the same production process. The same conclusion was reached by M. Verzàr Bass and M. De Franceschini (Verzàr Bass 1989, 656; De Franceschini 1998, 649).

The 1992 research of the villa in Fornače, south of Piran, yielded a find of a wall of the maritime villa from the 1st century. The wall was build in *opus reticulatum* technique, but walls built later, upon reconstruction of the villa, were made in *opus incertum* technique. The debris discovered between the two walls contained many murex shells and snail shells, which again indicates that a *fullonica* could have operated there (Stokin 1992, 80).

The above examples of villas from the late antiquity along the western coast of Istria demonstrate that various parts of the villas were at some point in time used for different purposes and that new facilities were built to house production plants within the parameter of these maritime villas. This is further demonstrated by the archaeological finds discovered on the sea bed in Verige Bay – the most numerous are finds dating from the 4th, 5th and 6th century, located in front of the production section of the villa (Jurišić, Orlić 1987, 98-99).

During the 2nd and 3rd century the economic structure of Istria changed. A quick expansion of towns resulted in a drop of the number of people living on farms in the countryside. Following a period of stagnation, during which residential quarters of the villas were particularly poorly tended, the remaining parts of the villas were converted into facilities that could provide some income and insure a recovery and survival of the villa. It was in times like these that *fullonicae* installations were constructed in the maritime villas in Istria, prompted also by favourable conditions present there for such an operation (cattle farming in the Istrian mountains, wool production, sulphur deposits and habitats of purple-yielding shells). Certain buildings were modified to accommodate new activities, while new facilities were also built within yards or over the existing structures. In the period of late antiquity the villas were organised like small settlements which provided accommodation and work to a large number of people. In the case of the maritime villa in Verige Bay, the large hall with an apse within the *thermae* was converted into a Christian church, while the *frigidarium* pool was used as a baptistery. The large portico (*porticus miliaria*), *cryptoporticus*, and the adjacent rooms were converted into storage facilities. Besides, new rows of warehouses were constructed in the port section, in the vicinity of the cargo wharf.

The *fullonicae* in Istria were well organised and specialised for particular parts of the complex process. They supported large scale economy, as parts of north-Italian *fullonicae* establishments and cloth stores, whose main centre and export port was located in Aquileia.

LITERATURA/BIBLIOGRAPHY

Adam J. P., 1994, *Roman building: materials and techniques*, London

Arthur A., 1997, The villa at San Giovanni in Lucania, JRA 10, Ann Arbor, 598-611.

Begović Dvoržak V., 1990, Antička vila u uvali Verige na Brijunima, VAMZ XXIII, Zagreb, 97-110.

Begović Dvoržak V., 1995, Rezidencijalni kompleks u uvali Verige na Brijunima: primjer ekstrovertirane maritimne vile harmonično uklopljene u krajolik, HistriaAntiq 1, Pula, 47-53.

Begović V., Schrunk I., 1999-2000, Villae rusticae na Brijunskom otočju, OpuscA 23-24, Zagreb, 425-439.

Begović V., Schrunk I., 2001, Preobrazbe rimskih vila u kasnoj antici i ranom srednjem vijeku, PrilInstArheolZagrebu 18, Zagreb, 157-172.

Begović V., Schrunk I., 2004, Brijuni – primjer uspješnog antičkog gospodarstva, HistriaAntiq 12, Pula, 65-76.

Bergman B., 1995, Visualizing Pliny's villas, JRA 8, Ann Arbor, 406-420.

Bezeczky T., Pavletić M., 1996, New objects from the figlina of C. Laecanius Bassus, ŐJh 65, Wien, 143-163.

Bezeczky T., 1998, *The Laecanius amphora stamps and the villas of Brijuni*, Wien

Bodel J., 1997, Monumental villas and villa monuments, JRA 10, Ann Arbor, 3-35.

Boëthius A., Ward-Perkins J. B., 1970, *Etruscan and Roman Architecture*, Great Britain

Bradley M., 2002, "It all comes out in the wash": Looking harder at the Roman *fullonica,* JRA 15, Ann Arbor, 21-44.

Carandini A., Ricci A., 1985, *Settefinestre*, Modena

Casari P., 2004, *Iuppiter Ammon e Medusa nell'Adriatico nordorientale*, Roma

Cunliffe B., 1987, *Rome and her Empire*, London

De Franceschini M., 1998, *Le ville Romane della X regio (Venetia et Histria)*, Roma

De Francesch C., 1924, *Raccolta dei documenti medievali di Pirano 1*, Parenzo

D' Incà C., 2004, Pecore e lana nella decima regio orientale, HistriaAntiq 12, Pula, 205-216.

Flohr M., 2003, Fullones and Roman society: a reconsideration, JRA 16, Ann Arbor, 447-450.

Fox G. E., 1905, Notes on some probable traces of Roman fulling in Britain, Archaeologia 59, London, 207-232.

Gnirs A., 1901, Uberreste romische Ansiedlungen in der Gegend zwischen Pola und Rovigno, MZK 27, 128-130.

Gnirs A, 1915, Forschungen uber antiken Villenbau in Sudistrien, ŐJhBeibl 18, 99-164.

Jones B., 2000, *Vespasian,* London

Jurišić M., Orlić M., 1987, Brijuni, uvala Verige, antička luka, ArhPregl 28, Ljubljana, 98-99.

Jurkić Girardi, V., 1981, Građevinski kontinuitet rimskih gospodarskih vila, HistriaHisto 4/2, Pula, 70-105.

Kovačić V., Marchiori A., Rosada G., Tassaux F., Carre M., 2004., Loron-Lorun, Parenzo-Poreč, Istria; Una villa maritime nell'agro Parentino: la campagna di ricerca 2003, HistriaAntiq 12, 227-248.

Lafon X., 2001, *Villa Maritima*, Rome

Lauffer S., 1971, *Diokletians Preisedict*, Berlin

Lawrence A. W., 1983, A Skeletal History of Byzantine Fortification, BSA 78, 190-191.

Maiuri A., 1960, *Pompeii,* Novara

Matijašić R., 1998, *Gospodarstvo antičke Istre*, Pula

Mc Kay A. G., 1975, *Houses, Villas and Palaces in the Roman World*, Hudson

Mattingly D. J. 1985, Olive oil production in Tripolitania, u: Buck, Mattingly Town and country in Roman Tripolitania, Oxford, 27-46.

Menalo R., 2003, *Ranosrednjovjekovna skulptura*, katalog izložbe/exhibition catalogue, Dubrovnik

Mlakar Š., 1976, Fortifikacijska arhitektura na otoku Brioni "Bizantski kastrum", Histriaarch 6-7, Pula

Morteani L, 1885, Della città di Pirano, ArchTriest 11, Trieste, 223-343.

Pietrogrande A. L., 1976, *Le fulloniche* (Scavi di Ostia 8), Rome

Purcell N., 1987, Town in country and country in town, u: B. Mac Dougall, *Ancient Roman villa gardens*, Washington, 185-203.

Purcell N., 1995, The roman villa and the landscape of production, *Urban Society in Roman Italy*, New York, 151-179.

Reinhold M:, 1970, *History of purple as a status symbol in antiquity*, Bruxelles

Robertson R. H. S., 1986., *Fuller's earth: a history of calcium montmorillonie*, Hythe

Schrunk I., 1989, Dioklecijanova palača od 4. do 7. st., VAMZ XXII, Zagreb, 91-102.

Schrunk I., Begović V., 2000, Roman estates on the island of Brioni, Istria, JRA 13, Ann Arbor, 253-276.

Schwalb H., 1902, *Römische villa bei Pola*, Wien

Shatzman I., 1975, Senatorial Wealth and Roman politics, Coll. Latomus 142.

Small A. M., Buck R. J., 1994, The Excavations of San Giovanni di Ruoti, Volume I, *The Villas and Their Environment*, Toronto

Smith J. T., 1997, *Roman Vilas, A Study in Social Structure*, London - New York

Starac A., 1994, Carski posjedi u Histriji, OpuscA 18, Zagreb, 133-145.

Stokin M, 1992, Naselbinski ostanki iz 1. st. pr. n. š. v Fornačah pri Piranu, AVes 43, Ljubljana, 79-87.

Suić M., 1987, Cissa Pullaria - Baphium Cissense - Episcopus Cessensis, ARadRaspr 10, Zagreb, 185-215.

Suić M., 2003, *Antički grad na istočnom Jadranu*, Zagreb

Škegro A., 1999, *Gospodarstvo rimske provincije Dalmacije*, Zagreb

Tassaux F., 1982, Laecanii, recerches sur une famille senatoriale d' Istrie, L'Ecole Francaise de Rome, Antiquite 94, 227-269.

Tassaux F., 1998, Apports recents de l'epigraphie a l'histoire economique et sociale de Brioni, Epigrafia romana in area Adriatica, Macerata, 77-99.

Tassaux F., Matijašić R., Kovačić V., 2001, *Loron (Croatie)*, Bordeaux

Tchernia A., 1986, *Le vin de l'Italie romaine*, Rome

Torrenato N., 2001, The Auditorium site in Rome and the origins of the Villa, JRA 14, Ann Arbor, 5-32.

Uscatescu A., 1994., *Fullonicae y tinctoriae en el mundo Romano*, Barcelona

Verzàr-Bass, M., 1986. Le trasformazioni agrarie tra Adriatico nord-orientale e Norico, Societa Romana e impero tardoantico Editori Laterza, 647-883.

Verzàr Bass M,, 1987, A proposito dellallevamento nell'alto Adriatico, u: AAAd XXIX.1 (Vita sociale, artistica e commerciale di Aquileia romana), 257-280.

Ward Perkins J. B., 1981, *Roman Imperial Architecture*, Harmondsworth

Whittaker C. R., 1990, The consumer city revisited: the vicus and the city, JRA 3, Ann Harbor, 110-118.

Wilson A. 2001, Timgad and textile production, u: Mattingly D. J., Salmon J. *Economies beyond agriculture in the classical world*, London, 271-296.

Wilson A., 2003, The archaeology of the Roman *fullonica,* JRA 16, Ann Arbor, 442-446.

Zaninović M., 1967, Neki primjeri smještaja antičkih gospodarskih zgrada, ARadRaspr IV-V, Zagreb, 367-372.

Zaninović M., 1991a, Sol u antici naše obale, ZbornikANBH, Sarajevo, 255-264.

Zaninović M., 1991b, Marginalije o pučanstvu antičke Istre, OpuscA 15, Zagreb, 71-89.

Zaninović M., 1995b, Villae rusticae u pejsažu otoka i obale antičke Dalmacije, HistriaAntiq 1, Pula, 86-96.