

REGIONALNI OBSEG LIBURNIJSKIH PLASTI

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Plasti med zgornjo kreda in eocenom v jugozahodni Sloveniji ter Istri je Stache imenoval liburnijsko stopnjo. Objavil je vrsto opazovanj, katerih rezultate je združil v obsežno monografijo (Stache, 1889). V zadnjem času je bilo poudarjeno, da liburnijska stopnja ni pravilno ime, ker te plasti obsegajo več stopenj: spodnji, srednji in zgornji paleocen (Pavlovec, 1963).

Klasična nahajališča liburnijskih plasti so v raznih delih jugozahodne Slovenije, lepe profile z nekoliko specifičnim razvojem pa dobimo tudi južneje v Istri (Pazin, Labin, Raša). Del liburnijskih plasti je sicer lahko sladkovodnega nastanka, vendar je več brakičnih ali morskih plasti, kot so mislili doslej (Pavlovec, 1963). Poudariti je treba še to, da so bile najdene pogostne foraminifere tudi v plasteh s številnimi oogoniji haracej. Vendar morje ni moglo biti odprto ali globoko. Poleg favne kaže na to hitro horizontalno in vertikalno spreminjanje sedimentov.

Liburnijske plasti moramo torej definirati stratigrafsko (spodnji in srednji paleocen ter spodnji del zgornjega paleocena), paleontološko (*Cosinia*, *Stomatopsis*, *Orbitolites*, *Coscinolina*, *Operculina*, *Rhipidionina*, *Rhapydionina*, miliolide, *Chara* itd.) in petrografsko (horizontalno in vertikalno hitro se menjavajoči navadno precej bituminozni apnenci in laporji, ponekod vložki premoga). Po takšni definiciji lahko istrske terciarne sedimente pri Labinu in Pazinu imenujemo liburnijske plasti, čeprav vključujejo že facialne razlike (npr. plasti s *Perna* sp., debeli vložki premoga itd.).

Čim dlje gremo od klasičnega ozemlja liburnijskih plasti, tem težje pričakujemo takšne sedimente. V Dalmaciji, Bosni in Hercegovini jih sicer ugotavljajo, vendar doslej ni nikjer znanih dobrih profilov. To ime so dobili zaradi stratigrafske lege (ki pa še ni povsem jasna) in fosilov (miliolide, haraceje in drugo).

Normalno nadaljevanje liburnijskih plasti sledimo v Furlaniji, kjer pa so zelo redko razkrite. Najzahodnejše najdišče je Monte di Medea kake 4 km jugozahodno od Krmina (Desio in Martinis, 1950; Martinis, 1962).

Bonni in Vanossi (1960, 45) omenjata, da spominjajo nekatere plasti in favna v zahodni Liguriji na brakični paleocenski razvoj (»Liburnico«). Richter (1961, 117) gre še dalje in te plasti označuje kot »liburnijska stopnja«. Pravi, da petrografsko in favnistično zelo spo-

minjajo na Stachejeve moncijske kozinske apnenice. V njih je našel ostreje, cirene, ceritije in haraceje.

Za zahodno Ligurijo velja toliko bolj pripomba, ki smo jo podali za Dalmacijo, Bosno in Hercegovino. Razdalja je prevelika, da bi tam mogli iskati podaljšek plasti, ki so nastale v bazenu z dokaj specifičnimi sedimentacijskimi in najbrž tudi tektonskimi procesi.

Zanimivo je nadalje še to, da se liburnijske plasti pojavljajo v bazenu, ki ga na severu obdajajo Alpe, na jugu pa nenaguban plato (cf. Richter, 1962, 469 in 472). Ne da bi se podrobno spuščali v problem tega platoja, moramo ugotoviti, da na njem kakor tudi v Alpah ni liburnijskih sedimentov. Če je bil plato v paleocenu res nekaka stabilna masa, so torej nastale liburnijske kamenine v manjšem bazenu. Čeprav bi imel ta zvezo s kakim drugim bazenom zahodno od platoja, sedimentacijski pogoji ne bi mogli biti enotni v obeh kadunjah. Tudi to govori proti liburnijskim plastem v zahodni Liguriji.

Richter (1962, 475) podaja nadalje pripombe h Kossmatu (1913) oziroma Winklerju (1924). Prvi je prišteval Trnovski gozd in Hrušico Dinaridom, drugi Alpam. Richter poudarja, da so triadne in jurske plasti enako razvite od Velebita preko Snežnika do Hrušice in Trnovskega gozda. Podobno je tudi s kraško kreda. Temu moramo dodati dejstvo, da se pojavljajo rdeči laporji in skrilavci (*«scaglia»*) tudi na južni strani Trnovskega gozda in Hrušice. Te plasti pa so značilne za Alpe. Meja med obema gorstvoma je torej še vedno nerešeno vprašanje. Sedimentacijski bazen v najstarejšem terciarju je imel brez dvoma tesno povezavo z dogajanjem na alpskem in dinarskem delu, zakaj nastal je prav tam, kjer so bile stične točke med obema gorstvoma najtesnejše.

REGIONAL EXTENT OF THE LIBURNIAN STRATA

The strata between the Upper Cretaceous and Eocene in south western Slovenia and Istria have been termed Liburnian by Stache; he had published a great many observations the results of which were united in his extensive monography (Stache, 1889). It has been recently pointed out that the Liburnian sediments include several stages Lower, Middle and Upper Paleocene (Pavlovec, 1963). The classic finding places of the Liburnian strata are in various parts of south western Slovenia and fine sections with a rather specific development can be also found in the southern Istria (Pazin, Labin, Raša). A part of the Liburnian strata might be of fresh-water origin, but there are more brackish-water or marine sediments as it has hitherto been assumed (cf. Pavlovec, 1963). It is necessary to emphasise here that a lot of foraminifers have been found in the strata with numerous oogonia of Characeae. But the sea could have been neither open nor deep; besides fauna as well the fast changing of sediments in both the horizontal and the vertical direction are pointing to it.

The Liburnian strata have to be defined: 1. stratigraphically (the Lower Paleocene, the Middle Paleocene, and lower part of the Upper

Paleocene); 2. paleontologically (*Cosinia*, *Stomatopsis*, *Orbitolites*, *Coscino-lina*, *Operculina*, *Rhipidionina*, *Rhapydionina*, *Miliolidae*, *Chara* etc.); 3. sedimentologically (various, horizontally and vertically fast alternating, usually rather bituminous limestone and marl, in some place coal intercalations). According to such a definition we may the Istrian Tertiary sediments at Labin and Pazin call Liburnian strata, though they include facial varieties already (e. g. strata with *Perna*, thick coal intercalations etc.).

The further we go away from this classical region of the Liburnian strata the harder we expect to get such sediments. In Dalmatia, Bosnia and Herzegovina investigators are identifying them, but until now no good sections have been known there. The strata have been named as Liburnian according to their stratigraphic position (which has not been cleared yet entirely) and because of the fossils (*Miliolidae*, *Characeae* etc.).

A normal continuation of the Liburnian strata we trace in Furlania, where they are very rarely revealed. The westernmost finding place is Monte di Medea about 4 km. SW of Cormons (Desio and Martinis, 1950; Martinis, 1962).

Bonni and Vanossi (1960, 45) mentioned that some strata and the fauna in western Liguria remind of the brackish-water Paleocene sediments ("Liburnico"). Richter (1961, 117) even defined these strata as "Liburnian series"; he stated that they were very much alike the Stache's Montian Kozina limestones, petrographically and faunistically. He had found *Ostrea* sp., *Cirena* sp., *Cerithium* sp. and Characeae in them.

What has been said for Dalmatia, Bosnia and Herzegovina is even more suitable for western Liguria. It is too great distance that we could search there for the extension of strata which have originated in a basin with rather specific sedimentary processes, and probably tectonic ones too.

Of the further interest is the fact that the Liburnian strata occur in a basin surrounded in the north by the Alps and in the south by a not folded plateau (cf. Richter, 1962, 469 and 472). Without enter into details of the problem of this plateau we have to state here that on it as well as in the Alps there are no developed Liburnian sediments. If the plateau really acted as a stable mass in the Paleocene then the Liburnian rocks originated in a smaller basin, even if the latter had had the connections with any other basin westward of the plateau, the conditions of sedimentation could not have been uniform in both basins. And this, too, denies the existence of Liburnian strata in western Liguria.

Then Richter (1962, 475) gave some observations on Kossmat (1913) and Winkler (1924) respectively. The former regarded Trnovski gozd and Hrušica as parts of the Dinaric Alps, the latter assigned them to the Alps. Richter is pointing out that the Triassic and Jurassic strata are equally developed from Velebit over Snežnik to Hrušica and Trnovski gozd and so is with the Dinaric Cretaceous. Here the fact to be added that the red marls and shales ("scaglia") also occur on the southern side of Trnovski gozd and Hrušica. These strata, however, are a characteristic of the Alps. The border between the two mountain systems

is still an unsolved problem. In the oldest Tertiary the sedimentation basin was without doubt closely connected with the occurrences in the Alpine and Dinaric part; it originated just there where the convergent points between the two mountain systems were the firmest.

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