## PLATE 1

Fig. 1. Flaser and linsen structures in wadden-like tidal deposits (subfacies IVc). Bed 33 and underlying bed, $F$. cucumiformis Zone, section $X$ at Serraduy. The length of the handle of the hammer is 55 cm . Detail of the channel of PI. 2, Fig. 3.

Fig. 2. Angular unconformity in the dark grey marls of the Ager Formation south of Merli, F. corbaricus Zone, Ypresian. The bases of the white and the black v's indicate the maximum extension of the unconformity visible in the outcrop.

Fig. 3. Irregular and undulating bedding planes in a coral reef (subfacies VIIId). Beds M-47 and M-48, uppermost part of lower half of $F$. corbaricus Zone, section M, northeast of Beniure. The reef is overlain by nodular reef channel limestones (subfacies IXb). The length of the handle of the hammer is 55 cm .

Fig. 4. Irregular bedding in a coral reef (subfacies VIIId). The larger and smaller nodules are coral colonies. The interspaces consist of limestones containing detrital reef material (foraminifera, molluscs, fragments of corals, etc.). Bed A-59, upper part of $F$. corbaricus Zone, section A, 2 km east of Llimiana. The length of the handle of the hammer is 55 cm .

Fig. 5. Vertical rock wall at the middle of the photograph: reefal deposits of beds A-29 - A-39, lower part of $F$. corbaricus Zone, section A. Slightly receding part in the lower half of the wall consists of coral-algal reefs; fore-reef deposits of Lithothamnium ridges occur in the upper half. Palaeoslopes with dips of up to $30^{\circ}$ can be observed in these fore-reef deposits. The bases of the white v and the right black v indicate the uppermost part and the lowermost part of such a palaeoslope, respectively; the basis of the left black $v$ indicates another palaeoslope.

Fig. 6. Coral-algal reef (subfacies VIIIc). The larger nodules (up to ca. 20 cm ) are coral colonies, the small ones ( $0.5-2 \mathrm{~cm}$ ) are Lithothamnium colonies. This reef correlates with the beds A-29a - A-29e (lower part of $F$. corbaricus Zone) and is situated some tens of metres east of section A. Box of measuring-tape is about 5.5 cm long and high.


## PLATE 2

Fig. 1. Giant-sized megacross-bedding (subfacies Va) exposed along the River Isábena at Serraduy. Bed 43, lower part of F. ellipsoidalis Zone, section X. This large sedimentary body cuts into wadden-like tidal deposits (belonging to the $F$. cucumiformis Zone). A distinct angular unconformity separates both subfacies. Right of the middle of the picture a horizontally layered lag deposit separates the giant ripple from the tidal deposits. At the bottom left the erosive base of bed 21 has been indicated by a white $v$ and a black $v$.

Fig. 2. Giant-sized megacross-bedding (subfacies Va ) exposed in small valley perpendicular to the River Isábena at Serraduy. The base of the giant ripple has been indicated by two white v's. The angular unconformity between the giant ripple and the underlying tidal deposits is clearly visible. The basal nodular limestones of subfacies VIc and VId occur just at the bottom of the picture. F. cucumiformis Zone and F. ellipsoidulis Zone, section X.

Fig. 3. Large channel with flaser and linsen structures in the lower part of the wadden-like tidal deposits (subfacies IVc). The upper boundary of this channel has been indicated by a dashed line. $F$. cucumiformis Zone, section $X$. The length of the handle of the hammer is 55 cm . For a detail see PI. I, Fig. I.

Fig. 4. Channel filled with sands and clayey sands cutting into muddy sediments. Wadden-like tidal deposits (subfacies IVc), F. cucumiformis Zone, section X. The length of the handle of the hammer is 55 cm .


## PLATE 3

Fig. 1. Flute marks and deep straight groove marks which have been affected with the flute marks. Differences up to $45^{\circ}$ with respect to the general current direction. Current direction from the left to the right. Subfacies IVe, F. cucumiformis Zone, section H, northwest of Tendruy. Magnification approximately $0.54 \times$.

Fig. 2. Various types of flute marks: small-scale flute marks (at the top) and larger ones (at the bottom); they are often developed as longitudinal furrows and ridges, sometimes they are pillow-like. Narrow groove marks are sharp, the wider ones have a more rounded profile. Current direction from the left to the right. Subfacies IVe, F. cucumiformis Zone, section H, northwest of Tendruy. Magnification approximately $0.44 \times$.

Fig. 3. Parallel lamination with some burrow activity. Upper right most obvious burrow with v-shape. Subfacies IIIb, upper part of $F$. corbaricus Zone. This bed correlates with bed A-69 and is situated some tens of metres east of section A. Magnification approximately $0.73 \times$.

Fig. 4. Polished surface of colony of brain coral (Leptoria) with bore-holes of pelecypods which still contain the shells. From a coral reef (subfacies VIIId) in the upper part of the $F$. corbaricus Zone (bed A-5la) of section A, 2 km east of Llimiana. Full-size.

Fig. 5. Grazing trail in tidal deposits of subfacies IVb. Bed. F-52, F. cucumiformis Zone, section $F^{\prime}$, near small pass north of Aransis. Magnification approximately $0.5 \times$.


## PLATE 4

Fig. I. Linthia hovelacquei Cotteau. Characteristic echinoid of subfacies XIIb. Bed 56, lower part of $F$. corbaricus Zone, section X, Serraduy. Magnification $1.5 \times$.

Fig. 2. Ditremaster cf. alarici (Tallavignes). Echinoid occurring in subfacies XIIa and facies XI. F. ellipsoidalis Zone, section W, south of Soperún. Magnification I.5×.

Fig. 3. Schizaster aff. vilanovai Cotteau. Characteristic echinoid of subfacies XIIb. Bed K-19, F. ellipsoidalis Zone, section K, 2 km west of Guardia de Tremp. Magnification $1.5 \times$.

Fig. 4. Lithothamnium colony from Lithothamnium ridge (subfacies VIIIb). Bed X-18, F. ellipsoidalis Zone, section W, south of Soperún. Full-size.

Fig. S. Patallophyllia sp. Characteristic solitary coral of subfacies XIIc. Bed H-108. lower part of $F$. corbaricus Zone, section H, near Sant Adria. Magnification $2 \times$.

Fig. 6. Patallophyllia sp. Large specimen. Bed 216, F. moussoulensis Zone, section U, southwest of Arén. Magnification $2 \times$.

Fig. 7. Pseudomiltha corbarica (Leymerie). Characteristic pelecypod of subfacies VIc and XIb. Bed 116, subfacies XIb, F. cucumiformis Zone, section R, 5 km east of Arén. Full-size.

Fig. 8. Spondylus eocenus Leymerie. Characteristic pelecypod of subfacies XIIa. Bed 210, F. ellipsoidalis Zone, section U, southwest of Arén. Full-size.

Fig. 9. Spine of Porocidaris serrata d'Archiac. Bed 275, F. moussoulensis Zone, section V, 5 km west of Arén. Magnification $2 \times$.


## PLATE 5

Fig. 1. Thin section of slightly sandy argillaceous limestone of facies XIV with Assilina. Nummulites and Discocyclina. Internally the calcite of the large Assilina test has largely been transmuted into chert. Also the chambers of this foraminifer have been filled by chert, thus forming a continuous piece of chert. Sample O-37, lower part of F. corbaricus Zone, section O, 5.5 km south of Puente de Montañana. Magnification $10 \times$. Fig. Ia. Plain light. Fig. 1b. Nicols crossed.

Fig. 2. Microfacies picture of subfacies Vlde. Silty and clayey limestone with molluscs and green algae (Halimeda). The molluscs occur often as fragments. The large gastropod belongs to the Cerithidae. The green algae are not shown on the photograph. Arrow indicates stratigraphic top of the photograph. Thin section. Magnification $10 \times$.

Figs. 3-5. Successive stages in the silicification of tests of the foraminifer Assilina. All specimens: subfacies XIVa, bed $0-43$, lower part of $F$. corbaricus Zone, section $0,5.5 \mathrm{~km}$ south of Puente de Montañana. Thin sections. Nicols crossed.

Fig. 3. Assilina sp. with isolated globules of chert. Magnification $38 \times$.
Fig. 4. Assilina sp. with many globules of chert. Magnification approximately $21 \times$.
Fig. 5. Assilina sp. with a continuous piece of chert in which the different globules can still be recognized. Magnification approximately $35 \times$.


## PLATE 6

Fig. 1. Microfacies picture of subfacies IIIc. Slightly sandy limestone (packstone) with many miliolids, alveolinids and specimens of Orbitolites (imperforate foraminifera association), and containing bird's-eyes and pseudomorphs of gypsum crystals. A large pseudomorph of gypsum with straight crystal boundaries and distinct angles can be seen in the lower half of the photograph. The gypsum has been replaced by a mosaic of many small calcite crystals, which are smaller along the border of the former gypsum crystal than in the centre. Thin section of sample P-5, F. cucumiformis Zone, section P, north of Benabarre. Plain light.

Fig. 2. The same as Fig. 1, but with two pseudomorphs of gypsum crystals and a part of a third pseudomorph. Nicols crossed.

Fig. 3. Microfacies picture of subfacies Vle. Pure limestone (packstone) with many internodes and fragments of internodes of the udoteacean alga $O v u l i t e s$ and with foraminifera (rotaliids. miliolids, valvulinids, etc.). Thin section of sample O-99, lower part of $F$. trempinus Zone, section O, ca. 5 km south of Puente de Montañana. Plain light.

Fig. 4. Microfacies picture of subfacies Xla. Pure limestone (packstone) with mixed imperforate-perforate foraminifera association: alveolinids, miliolids and nummulites. At the middle left an axial section of Fasciolites (Fasciolites) pasticillatus (Schwager, 1883) (number 1). At the top left a tangential section of $F$. ( $F$.) dolioliformis (Schwager, 1883) (number 2). Thin section of sample B-33, lower part of $F$. corbaricus Zone, section B, near Sant Miguel de la Vall; nicols not completely crossed.

Magnification of all figures $10 \times$. Large arrow indicates stratigraphic top of the photograph.



## PLATE 7

Fig. I. Microfacies picture of subfacies Xa. Pure limestone (packstone) consisting of reef debris. At the bottom a fragment of a coral colony, at the middle right a fragment of a Lithothamnium colony; between these fragments a piece of Halimeda (indicated by a white v). Further also miliolids, an alveolinid, specimens of Orbitolites and mollusc fragments can be observed. Thin section of sample A-39b, lower part of $F$. corbaricus Zone, section A, 2 km east of Llimiana. Plain light.

Fig. 2. Microfacies picture of subfacies IXa. Pure limestone (grainstone) with an imperforate foraminifera association, many fragments of the red alga Lithoporella, fragments of echinoids, etc. Internodes of the red alga Corallina are frequently observed in this subfacies, but are not on the photograph. The large, slightly meandering fossil with small rectangular compartments in the centre of the photograph is a complete specimen of Lithoporella. Thin section of sample K-36, basal bed of upper part of $F$. corbaricus Zone, section K, 2 km west of Guardia de Tremp. Plain light.

Fig. 3. Microfacies picture of subfacies XIIIb. Pure limestone (packstone) with many fragments of fossils. Two specimens of Biflustra occur (indicated by white v`s) which show geopetal structures. Imperforate foraminifera: Microfasciolites and Orbitolites. Thin section of sample L-75, upper part of $F$. corbaricus Zone, section L, northwest of Moró. Plain light.

Fig. 4. Microfacies picture of subfacies XIIIa. Slightly sandy limestone (packstone) nearly entirely consisting of fossil fragments. Perforate foraminifera association. Many fragments of various species of cheilostomatous and cyclostomatous bryozoans of which the most obvious examples have been indicated by white v's. At the top left a specimen of the cheilostomatous bryozoan Beisselina. Fragments and spines of echinoids frequently occur. Thin section of sample P-64, lower part of $F$. corbaricus Zone, section P , north of Benabarre. Plain light.

Magnification of Figures 1, 3 and 4: $10 \times$. Magnification of Figure 2: $28.5 \times$. Large arrow indicates stratigraphic top of the photograph.


## PLATE 8

Fig. I. Microfacies picture of subfacies XIVa. Sandy and silty limestone (packstone) with many nummulites and round to oval cross-sections through the tubes of Ditrupa (four specimens). Further also fragments of echinoids and of molluscs. Thin section of sample J-60, upper part of F. corbaricus Zone, section J, Guardia de Tremp. Nicols not completely crossed.

Fig. 2. Microfacies picture of subfacies XIVb. Silty and clayey limestone (packstone) with internodes of Conocrinus doncieuxi Roux, 1978 (two specimens at the middle left), pelecypods, fragments of pelecypods, a small gastropod (in the centre), Discocyclina (at the top left), a cross-section through the lunulitiform cheilostomatous bryozoan Lunulites (at the bottom right; indicated by a small arrow). etc. Thin section of sample 209, F. ellipsoidalis Zone, section U, southwest of Arén. Nicols not completely crossed.

Fig. 3. Microfacies picture of subfacies XIVb. Sandy and clayey limestone (packstone) with internodes of Conocrinus doncieuxi Roux, 1978 (four specimens; three in the lower half of the picture, and one at the middle left), many fragments of perforate foraminifera (Assilina), fragments of echinoids, of oysters (a large fragment occurs just below the large arrow) and of cheilostomatous bryozoans. Thin section of sample 302 , basal bed of $F$. corbaricus Zone, section X', La Fuente del Oro (north of La Puebla de Roda). Nicols not completely crossed.

Fig. 4. Microfacies picture of subfacies XIVc. Clayey limestone (packstone) with many molluscs, pelecypods as well as gastropods, which often occur as fragments. Many remains of cheilostomatous bryozoans (some have been indicated by a white v: Beisselina has been indicated with a small arrow), fragments and spines of echinoids, ostracods, etc. Thin section of sample 384, lower part of $F$. corbaricus Zone, section Z, south of Campo. Nicols not completely crossed.

Magnification of all figures $10 \times$. Large arrow indicates stratigraphic top of the photograph.





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P. A.M. GAEMERS, Leidse Geologische mededelingen, deel 51, ENCLOSURE II
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Two north-south horizontal sections in the eastern part of the Tremp Basin.

$\mathrm{H}^{\prime}$

## LEGEND FOR ENCLOSURES 5 and 6

| 1 | alveolinid biozonation |
| ---: | :--- |
| 2 | facies symbols |
| 3 | subfacies types |
| 4 | thickness in m |
| 5 | samples |
| 6 | Dunham＇s limestone classification |
| 7 | lithology with characteristic fossils |
| 8 | minerals |
| 9 | sedimentary structures |
| 10 | fossils |
| 11 | distribution of alveolinids |
| 12 | distribution and amount of larger benthonic foraminifera |
| 13 | additional remarks |

FACIES SYMBOLS（column 2）（also used in enclosures 2 and 3）

| facies I | deposits of swamps and rivers |
| :--- | :--- |
| lagoonal deposits |  |

## DUNHAM＇S LIMESTONE CLASSIFICATION （column 6）

| cest | tone |
| :---: | :---: |
|  | ckeston |
|  | kstone |
|  | instone |
| 5 | boundstone |

## LITHOLOGY（column 7）

家家 regularly，distinctly：bedded limestone
开目 massive limestone
Irregularly，indistinctly bedded limestone
nodular limestone
dolomite
， 1 dolomitic limestone
․․

E：：0 poorly sorted sandstone
siltstone
Nandy siltstone
$\square$ Pe：clayey fine sandstone
E：E Clayey siltstone
프를 clayey and sandy siltstone
E줘웍 marl
MINERALS（column 8）
p pyrite
$g$ glauconite
h haematite and other iron oxides
$m$ muscovite
b biotite
ch chert（mainly in nummulitids）
（p）pyrite in fossils

SEDIMENTARY STRUCTURES（column 9）
$\llcorner$ high－angle megacross－beddin
ca． 315 the same，with＂strike＂
$\stackrel{\langle }{326 / 25}$ the same，with ，，strike＂，\＆dip
$\perp 145$ the same，with height in cm
$\leftarrow \quad$ mega herringbones
low－angle megacross－bedding
trough－shaped megacross－bedding
$\geqslant$ herringbones of the same
high－angle small－scale cross－bedding
（ small herringbones
I megacross－bedding with opposite small ripples
low－angle small－scale cross－bedding
～current ripples
w wave ripples
e parallel lamination
－flaser－linsen structure
large channel（size order of meters）
$\underset{0-180}{-}$ the same，with length direction
$\underset{-200 \rightarrow}{ }$ the same，with width in cm
－$\$ 105$ the same，with depth in cm
－small channel（size order of decimeters）
－shallow channel（size orders of meters）
－small shallow channel（size order of decimeters）
－flute cast
／groove cast
$\rightarrow$ erosive surface
$\therefore \quad$ rain imprints
fining upwards in fossil debris
－fining upwards of sediment
－geopetal structure
$v$ load casts
$\sim$ • slump structures
mn convolute lamination
格 root traces
0 vertical burrows
－horizontal burrows
0 Callianassa－like burrows
（c）limestone concretion
ठ pseudonodule

## FOSSILS（column 10）

4 plant remains
Q．radiolarians
Lithothamnium
\＆Corallina
＝Lithoporella
－Acicularia
0 Halimeda
－Dasycladaceae
－other algae
－planktonic foraminifera
－sessile foraminifera
（2）Rheophax


It is always tried to give the fossils in order of succession according to their importance（quantity）

DISTRIBUTION AND AMOUNT OF LARGER BENTHONIC FORAMINIFERA（column 12）

0－1 specimens
1－3 specimens
－3－10 specimens
10－30 specimens
30－100 specimens
100 specimens
（The counts were always made in or recalculated for a standard area of $6 \mathrm{~cm}^{2}$ ）



