WARNANT

by M. LALOUX, E. GROESSENS, P. OVERLAU & H. PIRLET

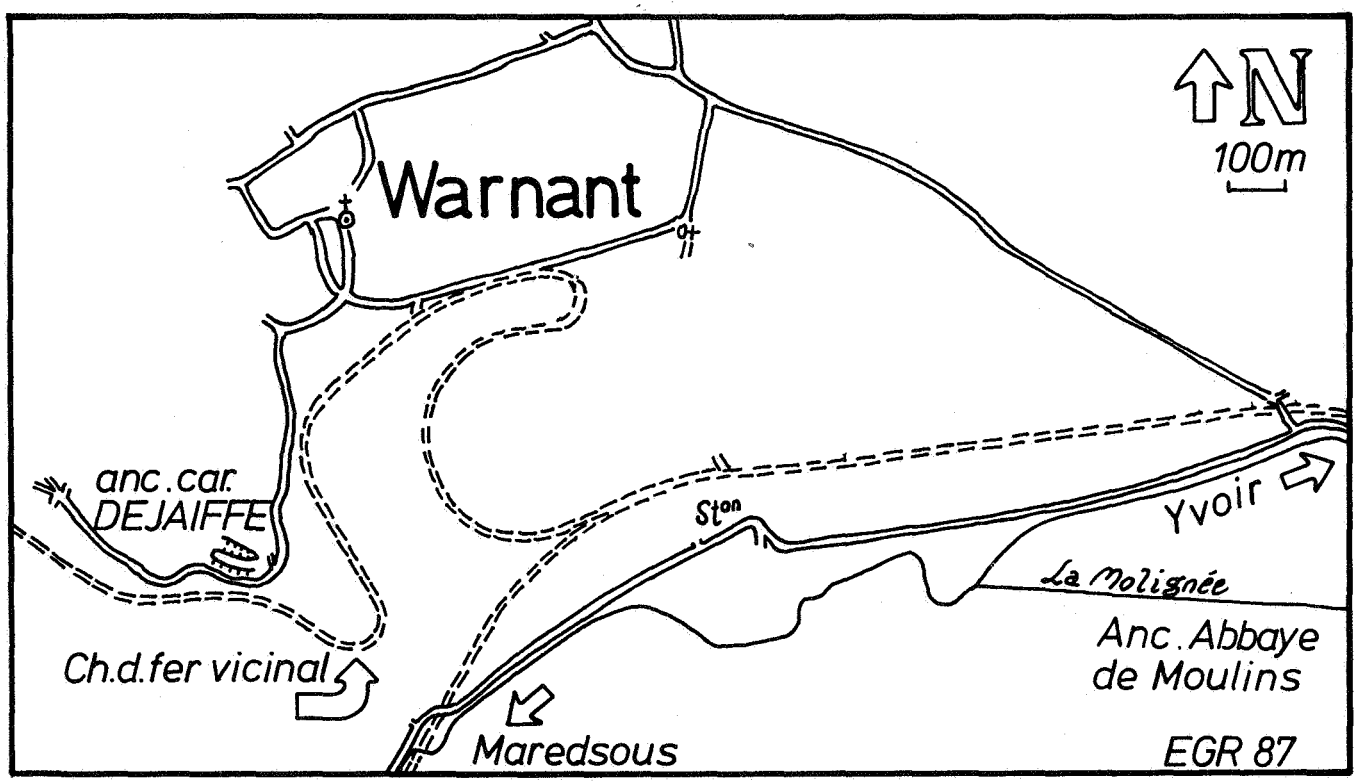

Figure 1. Localization

1. LOCALIZATION

A. Abandonned underground quarry of "Bleu Belge" marble known as DEJAIFFE quarry.
500 m S.W. of the church.
Reference : documents of the Geological Survey of Belgium : 166 W 151.
documents of R. CONIL : Bioul 7.
Type section of Upper Warnantian (fig. 2).

B. Abandonned railway trench, S.E. of the quarry (railway Warnant-St Gérard).
600 m South of the church.
Reference : documents of the Geological Survey of Belgium : 166 W 149.
documents of R. CONIL : Bioul 39 (fig. 3).

2. LITERATURE

- 1923 MAROTE, E. : Description of the marble quarry (fig. 45)
- 1934 DEMANET, F. : first description of the transition beds and their macrofauna
- 1936 KAISIN, Jr. F. : tectonical description of the site (fig. 3)
- 1938 DEMANET, F. : complementary faunal list (fig. 1)
- 1941 DEMANET, F. : descriptions of Namurian fauna
- 1964 BOUCKAERT, J. & HIGGINS, A. : Joined description of goniatites and conodonts (point 2, fig. 2)
- 1964 CONIL, R. & PIRLET, H. : First study of foraminifera - other specimens were published by CONIL, R. & LYS, M. in 1964 and 1965
- 1966 OVERLAU, P. : unpublished DSc. dissertation (University of Louvain). Macrosedimentological study and detailled log of the quarry (pl. 30 : car. DEJAIFFE n° 53/3-7).
- 1968 PIRLET, H. : Study of the rhythmic Upper Visean sedimentation.
- 1970 CONIL, R. & PIRLET, H. : Description of paleontological outline of the transition beds (point 5, fig. 3)
- 1974 CONIL, R. & PIRLET, H. : Excurions A5 *in* BOUCKAERT, J. & STREEL, M. ed. - Symposium of Namur.
- 1977 CONIL, R., GROESSENS, E. & PIRLET, H. : Definition of Warnantian.
- 1983 NZIBA, M. : 3rd cycle doctorat thesis - University of Lille (France) : Radiometrical anomalies.
- 1983 PAPROTH, E., CONIL, R. *et al.* : Definition of the formation "Couches de Warnant" - p. 226.

3. SHORT DESCRIPTION

From the bottom to the top (abandonned railway, abandonned quarry, shaft and upper trench).

Calcaire de Poilvache (V3bβ) : the Upper part of the formation is to be seen in the railway cut (sequence J, K1, K2 of PIRLET, 1968).

Calcaire d'Anhée (V3bγ) : - the sequences - 2 to 6 (gris bancs) of PIRLET (1968) outcrop in the railway cut.
- the two upper sequences (7, 8 : "Bleu Belge") are exposed in the underground quarry.

Couches de Warnant (V3c) and transition to the Namurian : - the Lower limit of V3c is placed by F. DEMANET (1934, p. 449 ; 1938, p. 8 non-fig. 1 ; 1958, p. 101) and H. PIRLET (1968) beneath black argillous beds known as "Bancs de Desserre". - R. CONIL & H. PIRLET (1970, fig. 3) placed this limit some two meters lower into the uppermost part of the "Bleu Belge". Refering to the thickness of the lower V3c given by F. DEMANET (7 m) which do not correspond to those mesured in the quarry (almost 5 m). - Nevertheless, R. CONIL & H. PIRLET, join the original definition in 1974.

Lithology

a. Lower member (lower V3c) : 5 m of bioclastic dark blue cherty limestone, thin bedded with argilleous intercalations. This beds are seen at the entrance of the underground quarry.

b. Upper member (Upper V3c) : 8 m of alternation of shales, calcareous shales, argilleous limestones and cherts. The shales, which are dominant in the upper part contain phosphatic nodules with radiolaria and well preserved cellular tissue of *Archaeocalamites*. Numerous radioactiv picks have been detected in this interval (NZIBA, unpublished).

c. 5 m of unfossiliferous sandy shales.

d. brown shales, dated as Arnsbergian (subzone E2a1).

4. PALEONTOLOGY

a. Goniatites :

- *Goniatites striatus :* bed 55, lower V3c ; subzone GOβ in Germany, Zone GF 15 (P1b) in Great-Britain.
- *Goniatites koboldi (spirale s.s.)*, bed 75, upper V3c ; subzone Goβ in Germany, Zone GF 15 (P1d) in Great-Britain.
- *Goniatites granosus :* beds 78 and 86, upper V3c ; subzone GOγ in Germany ; Zone GF 16 (P2a) in Great-Britain.
- *Lusitanites subcircularis :* bed 93, upper V3c ; subzone GOγ in Germany, Zone GF 16 (P2b) in Great-Britain.
- *Eumorphoceras bisulcatum* and *Cravenoceras cowlingense :* brown shales ; subzone E2a1.

b. Lamellibranchs and brachiopods :

These are listed *in* F. DEMANET's publications.

The presence of *Posidonomya membranacea* in bed 99 of upper V3c and of *Martinia* aff. *glabra* in bed 102, also upper V3c, is to be pointed out.

c. Ostracods :

They are abundant in some residues of the dissolution of the limestones for conodont separation.

They are mainly Kirkbyacea and Bairdiacea pseudomorphosed into fluorapatite (lower V3c, M. COEN, unpublished information).

d. Conodonts :

Conodonts have been described by F. DEMANET (1938), J. BOUCKAERT & A. HIGGINS (1963) and A. HIGGINS & J. BOUCKAERT (1968).
They are well represented in the upper member.
We can point out :

- *Gnathodus girtyi* (beds 93 to 102)
- *Paragnathodus commutatus* (beds 93 to 102)
- *Paragnathodus cruciformis* (beds 93 & 100)
- *Cavusgnathus naviculus* in bed 95

The last conodonts recorded came from bed 102.

e. Foraminifera

- *Pseudoendothyra* appears in sequence J of Calcaire de Poilvache (fig. 3)
- *Cribrostomum* and *Bradyina rotula*, guide-fossils of subzone Cf6γ appears respectively in sequences - 2 and 0 of Calcaire d'Anhée (fig. 3).

Detailled distribution of foraminifera in the "Couche de Warnant" is given on fig. 2.

- *Warnantella* and *Loeblichia paraammonoides* guides of the Cf6δ subzone, appear respectively in beds 50 and 51 (Lower V3c).
- *Janischewskina* exists in bed 87 (Upper V3c).

The last foraminifera (*Pseudoammodiscus* and *Asteroarchaediscus*) have been found in bed 95 (Upper V3c).

5. THE "BLEU BELGE" MARBLE (E. GROESSENS)

The "Bleu Belge" marble was quarried in a few, often underground quarries at Anhée, Bioul, Falaën in the vicinity of Dinant and Bouffioulx, Couillet and Fontaine-l'Evêque near Charleroi.

It is a black dense micritic limestone crossed by a network of white calc-spar veins. It occures in the Uppermost Dinantian into well stratified beds which thickness varies from 0.30 to 0.80 m.

This network of white calc-spar is due to the tectonical movements which broke the black marble ; from there that the "Bleu Belge" marble exist only in the most dislocated parts of the massifs and that tentatives quarries were opened and quickly abandonned in other parts.

The calc-spar network shows generally a symmetry of parallel lenthened "S" indicating the tectonical deformation.

The nicest marble variety, called "Mélange" is those showing the largest calc-spar veins.

The total thickness of the quarried "Bleu Belge" level varies around 8 to 9 m. Some beds contain cherts which was the main flaw of this first quality ornemental stone which was exported not only in Europe but also to the United States where it was appraised.

Industrial archeology

The history of the workings of "Bleu Belge" is difficult to trace at his beginnings.

At a couple of kilometers from the

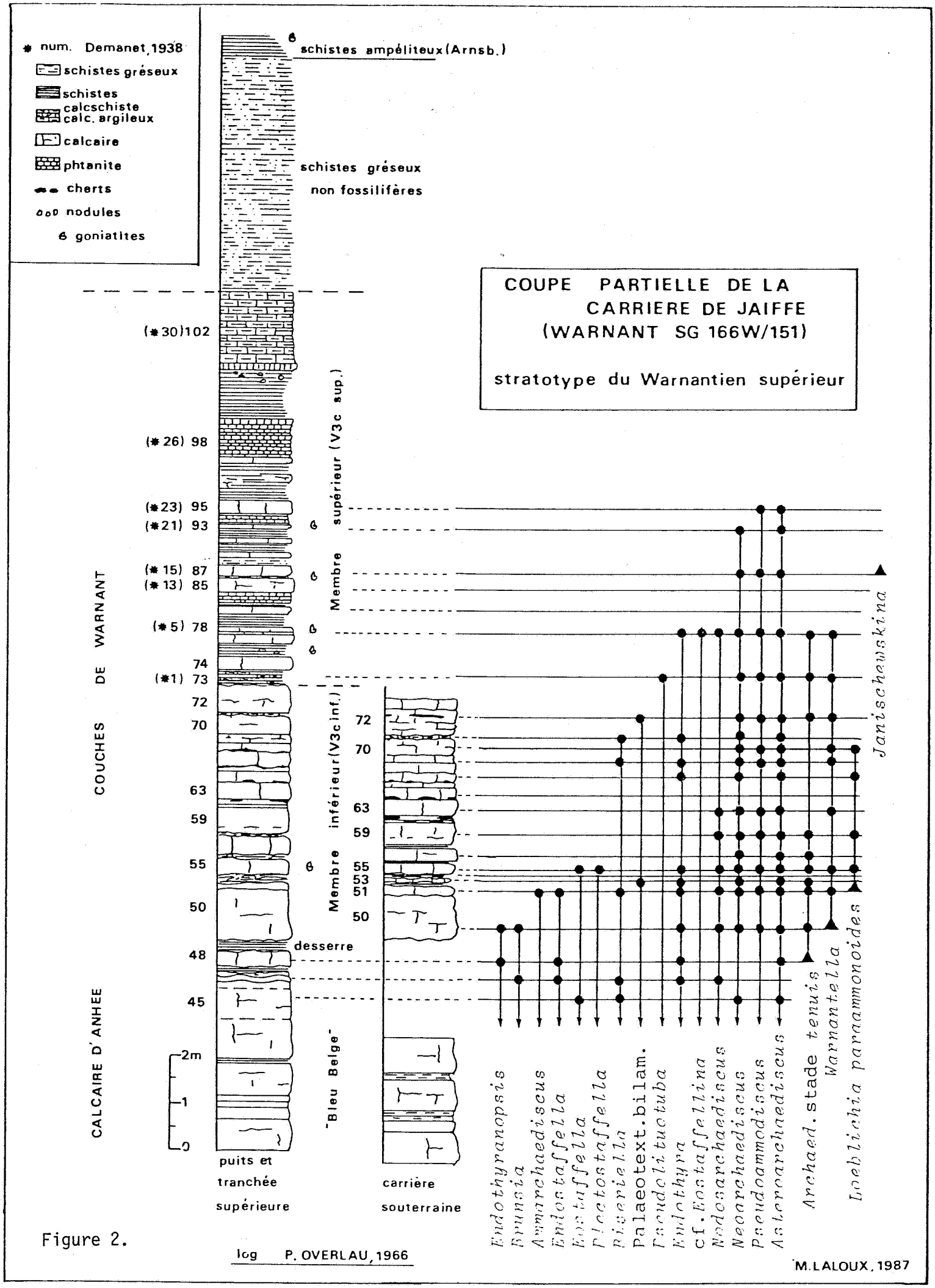
num. Demanet, 1938
schistes gréseux
schistes
calcschiste
calc. argileux
calcaire
phtanite
cherts
nodules
goniatites
schistes ampéliteux (Arnsb.)
schistes gréseux
non fossilifères
COUPE PARTIELLE DE LA CARRIERE DE JAIFFE (WARNANT SG 166W/151)
stratotype du Warnantien supérieur
COUCHES DE WARNANT
CALCAIRE D'ANHEE
Membre supérieur (V3c sup.)
Membre inférieur (V3c inf.)
desserre
"Bleu Belge"
(*30) 102
(*26) 98
(*23) 95
(*21) 93
(*15) 87
(*13) 85
(*5) 78
74
(*1) 73
72
70
63
59
55
53
51
50
48
45
2m
1
0
puits et tranchée supérieure
carrière souterraine
Endothyranopsis
Eumasia
Ammarchaediscus
Endostaffella
Eostaffella
Plectostaffella
Biseriella
Palaeotext. bilam.
Paradolituctuba
Endothyra
cf. Eostaffellina
Nodosarchaediscus
Neoarchaediscus
Pseudoammodiscus
Asterarchaediscus
Archaed. stade tenuis
Warnantella
Loeblichia paramonoides
Janischewskina
log P. OVERLAU, 1966
M. LALOUX, 1987

Figure 2.

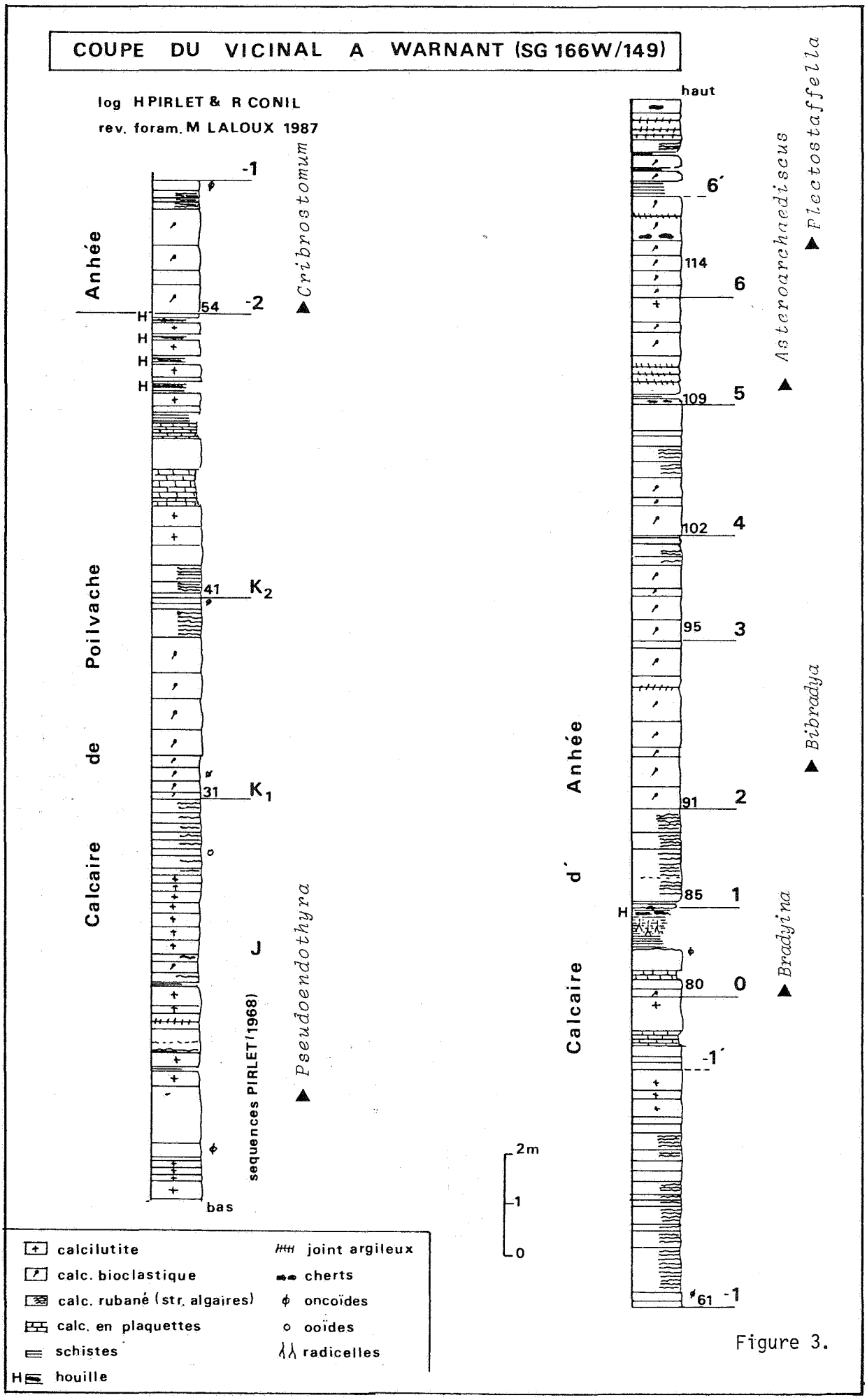
COUPE DU VICINAL A WARNANT (SG 166W/149)
log H PIRLET & R CONIL
rev. foram. M LALOUX 1987
Anhée
Poilvache
de
Calcaire
J
sequences PIRLET 1968
-1
-2
54
41
K2
31
K1
bas
Cribrostomum
Pseudoendothyra
haut
6'
114
6
109
5
102
4
95
3
91
2
85
1
80
0
-1'
61
-1
Asteroarchaediscus
Plectostaffella
Bibradya
Bradyina
2m
1
0
calcilutite
calc. bioclastique
calc. rubané (str. algaires)
calc. en plaquettes
schistes
houille
joint argileux
cherts
oncoïdes
ooïdes
radicelles

Figure 3.

Warnant quarry existed during the 18th century, a hydraulic emery-whell, polishing marble tiles at the Abbay of Moulins (*see* for localization on fig. 1) but only Lower Visean Black Marble of Dinant coming from the quarry at the Road of Salet seems to have been produced. Nor A.L. WIRSING (1775, p. 71), nor the maps of FERRARIS (1771-1778) who mention the Moulins Abbay works, do notice "Bleu Belge" works. P.F. CAUCHY (1825) mention in his memoir on the geology of the Namur Province marbles from Thon, which could be refered to "Bleu Belge" : *"N° 79 - On a exploité, dans quelques-unes des carrières de Thon et Samson, deux bancs susceptibles de fournir des marbres qui, pour n'être pas fort connus, n'en méritent pas moins d'être cités ici. Ils présentent, sur un fond gris bleuâtre, de petites veines et taches dont les unes sont d'un gris beaucoup plus clair et les autres d'un bleu beaucoup plus foncé".*

M. DRAPIEZ (1823) in a similar memoir concerning the Hainaut Province noticed that any such quarry is active in the vicinity of Charleroi, p. 72 : *"Enfin, plus loin encore parmi les rampes au pied desquelles serpente la Sambre, se montrent, vers Landely, de puissantes masses de marbre qui semblent offrir leurs flancs à qui voudra utilement les ouvrir et les déchirer ; elles s'étendent jusqu'à Mont-sur-Marchienne où des stratifications d'argile avec ce même calcaire, donnent à la pierre un aspect rubanné ; la disposition presque droite des lignes l'a fait surnommer 'marbre-callemande'."*

The name "Bleu Belge" appears in the second half of the 19th century. It is mentionned in a treatise of Civil Engineering published in Paris by A. DEMANET in 1862.

"Bleu Belge" from the quarry "Bois-des-Cloches" at Couillet is exposed by PUISSANT FRERES at the International Exhibitions of London in 1862 and Paris in 1867.

At the Antwerp exibition of 1885 two marble cutters of Namur exposed "Bleu Belge" - Gustave LEFEVRE exposed blocs and PIRSON slices.

In 1887, at the 5th exhibition of the "Société belge des Ingénieurs et Industriels" "Bleu Belge" produced by the Society MERBES-SPRIMONT is showed, but no origin of the matter is given by Ch. LEGRAND in his account.

The same year, in a important paper on the marble industry, DEMARET, J. (pp. 531-532) list a number of localities, without much comment, but estimate the total annual production at 400 m3.

Ten years laters, at the International Exhibition of Brussels, only "Bleu Belge" marble from the V. MUTSAERT et Cie at Bioul is exposed (RABOZEE, H., 1897).

This quarry will be cited in the recent litterature as quarry "Noire-Terre" and quarried by MERBES-SPRIMONT till the early 1960th (*see* P. DUMON, 1959 - for a full description, reproduced in E. GROESSENS, 1981, p. 241).

This quarry was also described by E. MAROTE (1923), still under the name Mutsaert.

E. MAROTE (1923) give a detailled description and a figure of a second quarry - the Dejaiffe Quarry - we visit today.
This quarry as well as the Railway trench was visited by the "Société belge de Géologie" in 1901 (*see* vol. 28, pp. 337-340).

The quarry seens to be out of activity before the last world war. Indeed, in 1947, at the Centenary Meeting of the Engineers Association of Liège, only two quarries are mentionned :
H. DAFFE at Anhée and Noire-Terre at Bioul (MERBES-SPRIMONT).

After a prospecties of the "Union des Carrières et Scierie du Marbre de Belgique" (1948), four members of this association produce "Bleu Belge" :

- A. MARMOR works the "Gros-Thiou" quarry at Bioul ;
- S.A. Carrière de Marbre d'Anhée

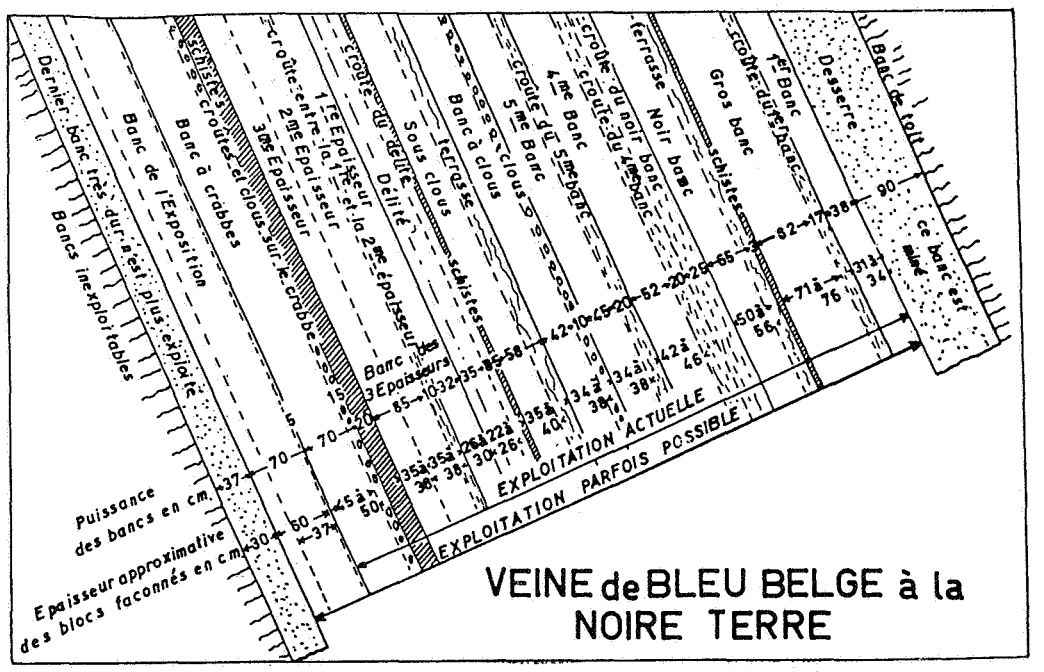

Figure 4. "Noire Terre quarry" after P. DUMON, 1962.

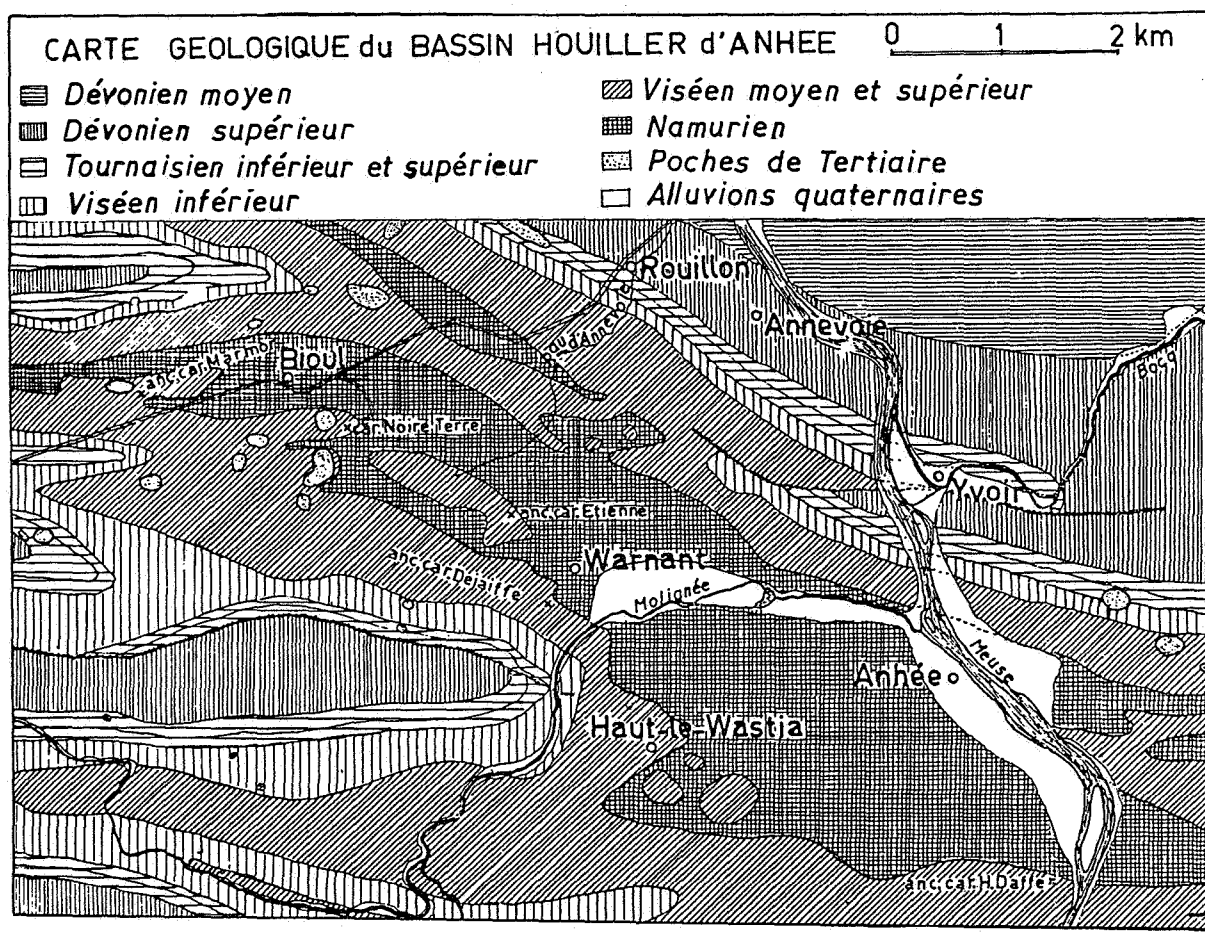

Figure 5. Localization of "Bleu Belge" marble quarries in de vicinity of Warnant (P. DUMON, 1962, after the Geological Map of Belgium - 1/40 000)

(H. DAFFE of Ligny) quarries at Anhée ;
- S.A. MERBES-SPRIMONT works at "Noire-Terre" (Bioul) ;
- S.A. STENUICK works a quarry at Fontaine-l'Evêque.

The two last mentionned quarries were still active in the early 1960th., but were closed a few years later.

The marble quarried at Fontaine-l'Evêque was also called "Veiné Saint Christophe".

To complete the listing of "Bleu Belge" works, a quarries has been mentionned at Bouffioulx and Châtelet by J. DEMARET (1887) and DARRAS in 1912.

Merbes-Sprimont owned in Bioul two other quarries named Foltia and La Gauche. Quarries named Pirmez and of Prince de Mérode did work at Bioul.

Other quarries are mentionned in the localities of Haut-le-Wastia, Falaën, Houx and Marchin but these must never have been important. At Saint-Aubin, near Florennes, it was called "Grand Antique Bleu Belge".

In Namur, a joiner, named DAVREUX opened one time a "Bleu Belge" quarry in the vicinity of the cemetery of Belgrade. The tectonical features of the quarry where described by M. LECOMTE (1932).

Because of the fame of the "Bleu Belge" some beds of the Frasnian were quarried to produce a "Genre Bleu Belge" from less quality because of, among other reasons, the presence of Stromatoporoïds appearing in grey on the black ground.

This Devonian marble was produced at Barvaux, Frasnes and in Entre-Sambre-et-Meuse. In the collections of the Geological Survey a "Genre Bleu Belge" from Feluy is displaid.

The main staircase of the Geological Survey's building is a good example of "Bleu Belge" employ.