ON THE OCCURRENCE OF DISTICHOPLAX PIA IN THE 
BAGH BEDS OF MADHYA PRADESH

AJIT KUMAR PAUL
ON THE OCCURRENCE OF DISTICHOPLAX PIA IN THE BAGH BEDS OF MADHYA PRADESH

AJIT KUMAR PAUL*

In the present communication, the author records the presence of Distichoplax Pia in the Upper Coralline Limestone horizon of the Bagh Beds of the Morena formation, M.P. The Bagh Beds represent the marine deposits of Cretaceous transgressive cycle which inundated much of Western India.

Distichoplax belongs to the algal family Corallinaceae. However, the exact position of the genus has long been a matter of controversy. Sometimes it was referred to as Lithothamnium, and Dietrich (1927) considered it to be only a portion of the perithallium. The (1934) pointed out that it was really a perithallium, and named the perithallium Distichoplax. Dietrich (1927) also considered that the genus belongs to the family Lithothamnium. However, Varma (1960) observed that photographs of D. biserialis from a wide variety of marine Palaeocene localities show such close analogies (though not complete similarity) with chitinous parts of living and fossil Rhabdopleura that it should no longer be considered an alga. However, Varma (1960), Sastry, Rao and Iqbaluddin (1963), Denizet and Massieux (1965), and others still retain the basic contentions of Pia (1934).

Varma (1960) discovered a new species, Distichoplax raoi Varma, from the Laki (Lower Eocene) beds of the Punjab Salt Range and proposed an emended diagnosis for the genus: "Platy encrusting or free-floating thalli. Mostly two, rarely three cells thick. Up to 2 mm. or more (?) in length. Each species represented by two types of thalli. One showing the two upper and lower rows of cells arranged at an angle inclined to the smooth horizontal axis. The other showing the two upper and lower rows of cells arranged perpendicularly upon the zigzag horizontal axis."

The occurrence of Distichoplax in the Bagh beds is quite significant since this is for the first time that Distichoplax is reported from strata considered to belong to the Cretaceous system. Another point of interest is that both D. biserialis Pia and D. raoi Varma are found to occur in the same beds here.

Systematic Description:

- **Phylum**: Rhodophycophyta
- **Family**: Corallinaceae
- **Subfamily**: Melobesioideae
- **Genus**: Distichoplax Pia 1934
  - Distichoplax biserialis Pia 1934
  - Distichoplax raoi Varma

*Fig 1 (x 100)*
Description: Thallus very thin and encrusting; shows a biserial arrangement of cells, perpendicular to the axis in the sections observed. The cells on either side of the axis are alternate. The axis shows zigzagging. Cells are 48-64 μ by 16-20 μ. Thickness of thallus varies from 110-128 μ. Length of thallus not given.

Horizon and locality: Maestrichtian (?); Sitapuri. Figured slide: C. L./12.

Distichoplax raoi Varma 1960

Figure 2

Description: Horizontally lying, flat, platy, encrusting or free-floating thalli. Two cells thick in the sections observed. Two rows of cells arranged perpendicularly on the zigzag axis. Each cell 16-18 μ wide and 24-32 μ high. Observed total thickness 48-64 μ.


Discussion

Distichoplax enjoys a unique status in the Tertiary stratigraphy all over the world. *D. hirsutus* has been reported from widely separated geographical areas such as Eastern Alps, Persia, Czechoslovakia, Pyrenees, Borneo, and Assam and Pondicherry in India. While showing wide geographic distribution, it is a minor taxon in most fossiliferous deposits.
graphical distribution, it shows a fairly limited geological range. In Western countries it is known from Upper to Middle Eocene. In fact, the genus was named for specimens from the Upper Lutetian-Lower Priabonian of the Carpathians and has been recorded from the Middle and Upper Eocene of Caledonia.

In India \textit{D. biserialis} is known from beds of Lower Eocene (Rao, 1947; Nagappa, 1951; Rama Rao 1953; Sastry, Rao and Iqbaluddin, 1963; Rajagopalan, 1967) and Lower to Middle Eocene (K. S. Rao, 1943, 1947). While describing the fossil algae from Assam, Rao (1943, p. 291) states: "The presence of \textit{Distichoplax biserialis} in the Upper Sylhet limestones only is useful in the determination of their age. This form has a very limited vertical range—from Middle to Upper Eocene. Therefore, the Middle Eocene age ascribed to the top of the Sylhet stage on foraminiferal evidence may be said to be in entire agreement with the criterion adopted in the age of the beds."

On the east coast, Rama Rao (1953) recorded \textit{D. biserialis} in Pondicherry limestone which shows an assemblage of Palaeocene foraminifera. Sastry, Rao and Iqbaluddin (1963) reported \textit{D. biserialis} from the Nerinea beds of Pondicherry and considered it to indicate a Palaeocene age for these beds. Rajagopalan (1967) recorded the occurrence of the genus in the Palaeocene of Vriddhachalam. The new species \textit{D. raoi}, erected by Varma (1960), occurs in the Lower Eocene Laki Beds of Punjab Salt Range in W. Pakistan. Varma (1960, p. 31) states: 'This genus is so far not known from beds other than of the Eocene age and the alga is, therefore, of great stratigraphic value as an ideal index fossil'.

The twin problem arising from the present find of \textit{Distichoplax} in the Bagh Beds may be summarised as follows: (1) The upper age limit of the Bagh Beds might have ranged beyond the Cretaceous, and at least the uppermost horizon of the Coralline Limestone might belong to the Palaeocene; or, (2) \textit{Distichoplax} might have existed in the Uppermost Cretaceous too, a proposition which is inconsistent with the universal acceptance of the genus as an index fossil for the Eocene.

It is too premature to make any suggestions relating to the above problems. Further studies are in progress for a correct interpretation on this matter.

Acknowledgement: The author is indebted to Prof. A. K. Ghosh, Department of Botany, Calcutta University, who suggested the problem and guided the work.

References:


Department of Botany, Calcutta University.
The present communication reports the occurrence of *Cayeuxia fructilosa* Johnson in the Coralline Limestones of the Bagh Beds of the Man river section, M.P. The Bagh Beds of West-Central India represent the marine deposits of Cretaceous transgressive cycle which inundated much of Western India. The presence of algae (Corallinaceae) in the Cretaceous of Narbada Valley was briefly commented upon by Chiplonker (1944). Recently, the authors took up a detailed study of the algae in these beds and found, among others, *Cayeuxia fructilosa*, a codiacean alga, which is being reported for the first time from the Indian sub-continent. This occurrence is significant since the species was originally described by Johnson (1965) from the upper horizon of the San Cristobal Formation which consists mainly of fossiliferous gray to tan limestones of Campanian-Maastrichtian age and a Maastrichtian age has been assigned for the species.

**Systematic Description**

Phylum *CHLOROPHYCOPHYTA* Papenfuss, 1946

Class *CHLOROPHYCEAE* Kuetzing, 1843

Order *SIPHONALES* Wille, 1884

Family *Codiaceae* (Trevisan) Zanardini, 1943

Genus *Cayeuxia* Frollo, 1938

*Cayeuxia fructilosa* Johnson, 1965. (Figs. 1, 2)

*C. fructilosa* Johnson, 1965, pp. 71-72, pi. 12, figs. 1-2; pi. 13, figs. 1-3.

Description.—Thallus irregular, more or less rounded, up to 2-2.5 mm across. Tubes 10–18 μ in diameter. Branching at wide angles. Branching frequent, particularly near periphery. Diameter varies in the same tube.

Remarks.—The material is essentially the rounded, up to 2-2.5 mm across. Tubes 10-18 μ in diameter. Branching at wide angles. Branching frequent, particularly near periphery. Diameter varies in the same tube.

Guatemala and British Honduras. A Late Upper Cretaceous to Maastrichtian age is assigned to the species. This is in full conformity with the age as suggested by Pal (1967) for the Upper Coralline Limestones from which the species is being reported.

**Horizon and Locality**

Upper Coralline Limestone; Deola, Sitapuri; Maastrichtian. Figured slides. CL. 01, CL. 19.

**Acknowledgments**

Thanks are due to Dr. J. Harlan Johnson, Emeritus Professor of Geology, Colorado School of Mines, who took much interest in the present work and made valuable suggestions.

Department of Botany, A. K. Pal
Calcutta University, Calcutta-19, June 1, 1968.


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Thanks are due to Dr. J. Harlan Johnson, Emeritus Professor of Geology, Colorado School of Mines, who took much interest in the present work and made valuable suggestions.
On Cayeuxia Frollo from the Bagh Beds, M, P,

By

A. K. Pal

CALCUTTA

September, 1968
On Cayeuxia Frollo from the Bagh Beds, M. P.
(with one plate)

In the present communication, the author records the presence of species of Cayeuxia in the Upper Coralline Limestone horizon of the Bagh Beds of the Man river section, M.P. The Bagh Beds of West-Central India represent the marine deposits of Creataceous transgressive cycle which inundated much of Western India. The presence of algae (Corallinaceae) in the Cretaceous of Narmada Valley was briefly commented upon by Chiplonker (1944). Recently the author took up a detailed study of algae in these beds and found, among others three species of Cayeuxia which is being reported for the first time from the Indian sub-continent.

Cayeuxia Frollo, 1938, belongs to Galaxiales family and essentially it is an upper Mesozoic form. They form rounded tufts that range from a few millimeters to more than a centimeter in diameter. Each tuft is composed of a mass of loosely packed, branching tubes having a radial arrangement. The distinctive feature of the genus is the character of branching. For a short distance, the branches grow away from the straight parent stem at an angle of nearly 45 degrees and then turn and grow approximately parallel to it; sporangia are unknown (Johnson, 1964). The geologic range of the genus, according to present knowledge, is from Middle Jurassic to Uppermost Cretaceous. The genus has been reported from Hungary, Morocco, Guatemala, British Honduras, Texas, Arizona and Oregon. The species are separated mainly on the basis of the diameter of the tubes (Johnson, 1964), in addition to characters like thallus shape, shape of cross section, length, diameter, tube arrangement etc. (Elliot, 1956; Frollo, 1938; Johnson, 1964, 1965; Kamptner, 1951).

**Systematic Description**

**CHLOROPHYCOPHYTA**

**CHLOROPHYCEA**

**SIPHONALES**

**CODIACEAE (Trevisan)**

**Cayeuxia**

*Cayeuxia fructilosa* Johnson, 1965

Figures 1(x100), 2(x100)

*C. fructilosa* Johnson, 1965, P. 71-72, pi. 12, Figures 1-2; pi. 13, Figs. 1-3.

**Phylum**

**Class**

**Order**

**Family**

**Genus**

**Species**

**Description.**

Thallus irregular, more or less rounded, up to 2-2.5 mm. across. Tubes 10-18 μm in diameter. Branching at wide angles. Branching frequent, particularly near the periphery. Diameter varies in the same tube.

**Remarks.**

The material is essentially the same as described by Johnson (1965) from Guatemala and British Honduras. A Late Upper Cretaceous to Maestrichtian age has been assigned to the species. This is in full conformity with the age as suggested by Pal (1967) for the Upper Coralline Limestones from which the species is being reported.
Horizon and Locality.
Upper Coralline Limestone; Deola, Sitapuri; Maestrichtian.

Figured slides: C.L. 01, C.L. 09.

**Oayeuxia minuta** sp. nov. Figure 3, (x 100)

Description.
Thallus irregular, jore or less rounded, 560–640* in length and 170–320* across. Tubes 7.7–8* in diameter. Tubes radially arranged and bifurcate at acute angles. Diameter of tubes more or less uniform.

Remarks.
This species appears to be new. The dimensions of the thallus as also the tube diameter are decidedly smaller than the species described so far. The species occurs in association with *Oayeuxia fructilosa* Johnson.

Horizon and Locality.
Upper Coralline Limestone; Sitapuri, Sitapuri; Maestrichtian.

Figured slide: C.L. 07.

**Oayeuxia chirakhanensis** sp. nov. Figure 4 (x100)

Description.
Thallus irregular, upto 2–3 mm. in the longer direction. Tubes 16–30* in diameter, bifurcate along regular partitions at intervals. Branching at acute angles. Tubes loosely packed, radially arranged.

Remarks.
This form is quite distinct from the species described so far. In tube diameter, it shows affinity to *C. kurdistanensis* Elliott (1956), but the latter has a nodular or rounded thallus as also the partitions mentioned above are absent in the species described b

Horizon and Locality.
Upper Coralline Limestone; Chirakhan; Maestrichtian.

Figured slide: C.L. 29.

Acknowledgement.
The work was carried out under the guidance of Prof. A. K. Ghosh, Reader in Botany of the University of Calcutta. Thanks are due to Dr. J. Harlan Johnson, Emeritus Professor of Geology of the Colorado School of Mines, who took much interest in the present work and made valuable suggestions.

References:
Indoscaphites karuna sp. nov. from the Bagh beds, M.P.

Ajit Kumar Pal and Ramendra Chowdhury.

The authors record the presence of Indoscaphites karuna sp. nov. from the Bagh Beds, M.P.; the present form, though essentially similar to Indoscaphites cunliffei (Forbes), redescribed by Spath (1953) as Indoscaphites cunliffei (Forbes), differs significantly from it with respect to size, shape, ornamentation and suture. I. karuna sp. nov. is a much bigger form with prominent keel on the ventral margin, which is entire. The shell is flat and compressed, involute with early whorls in contact, involute portion projected away from the conical whorls; shaft short, shaft-profile sub-rectangular, ribs strong and recti-radiate; every alternate ribs arise and bifurcates from the dorsolateral tubercles on shaft; umbilical and ventro-lateral tubercles present on shaft, connected by ribs; suture somewhat simplified.

This occurrence is quite significant since Indoscaphites is essentially a South Indian Upper Cretaceous form and Maestrichtian age has been assigned to the genus (Spath, 1953)
On Gayeuxia Frollo from the Bagh beds, M.P.  

A.K. Ghose and A.K. Pal.

In the present communication, the authors record the presence of three species of Gayeuxia Frollo in the Upper Coralline Limestone horizon of the Bagh Beds of the Narmada Valley, M.P. The Bagh Beds of West-Central India represent the marine deposits of Cretaceous transgressive cycle which inundated much of Western India. The presence of algae (Corallinaceae) in the Cretaceous of Narmada Valley was briefly commented upon by Chiplonker (1944). Recently, the authors took up a detailed study of algae in these beds and found, among others, three species of Gayeuxia which is being reported for the first time from the Indian sub-continent.

The following are the species described here:

(a) *Gayeuxia fructilosa* Johnson, 1965  
The material is essentially the same as described by Johnson (1965) from Guatemala and British Honduras. A Late Upper Cretaceous to Maestrichtian age has been assigned to the species.

(b) *Gayeuxia minuta* sp. nov.  
This species appears to be new in view of the dimensions of the thallus; as also the tube diameter is decidedly smaller than the species described so far.

(c) *Gayeuxia sp.*  
In tube diameter, it shows affinity to *G. kurdistanensis* Elliott (1956), but the latter has a nodular or rounded thallus whereas the present one has an irregular thallus.
In the present communication the authors record the presence of Peyssonelia antiqua Johnson, a squamariacean alga new to the Indian region, in the Bagh Beds of the Narbada Valley in M.P. The Narbada basin developed during Jurassic-Cretaceous times on the eroded early Mesozoic surface of the Indian shield and the Bagh Beds represent the marine deposits of the Cretaceous transgressive cycle laid down in these basins.

SYSTEMATIC DESCRIPTION

Phylum RHODOPHYCOPHYTA
Family SQUAMARIACEAE
Genus Peyssonelia Decaisne 1841
Peyssonelia antiqua Johnson 1964

Fig. 1 (x 37-5)

FIG. 1
Peyssonelia antiqua Johnson, 1964, Vol. 10, No. 2, p. 214, pi. 1, Fig. 2.

Description.—Small thin crusts consisting of a basal hypothallus, perithallus, and dermal layer. The hypothallus consists of a single layer of large irregular, more or less rectangular cells which commonly measure 24-40 μm high and 15-23 μm wide. The perithallus is formed of short vertical threads of rounded to rectangular cells, commonly 3 to 5 cells thick. Normally the threads have the largest cells at the base and the smallest at the top. The threads may bifurcate. Cells measure 15-36 μm high and 9-28 μm wide. An upper dermal layer consists of one or two layers of flat cells. These cells have a thickness ranging 7-13 μm, commonly 8-10 μm.

Remarks.—The present specimens strikingly resemble the type material described by Johnson (1964) from Iraq and those from Guatemala. The diagnostic features of the species are better represented in the present materials.

Horizon and Locality.—Upper Coralline Limestone; Palaeocene (?); Chirakhan, Sitapuri. Figured slide C.L./41.

The present find of Peyssonelia antiqua in the Bagh Beds is quite significant in view of the stratigraphy and age of these strata. Till recently fossil invertebrates served as the only means of ascertaining the age of these strata. Duncan (1865), Bose (1884), Vredenburg (1907), Chiplonker (1937-41) and others considered the fauna to be Cenomanian-Senonian in age while Fourtau (1918) considered the Bagh Echinoids to belong to the Albian. Recent palaeobotanical studies by the authors have yielded interesting results. Ghosh and Pal (1968) found in these strata Cayeuxia fructilosa Johnson, a codiacean alga belonging to the Uppermost Cretaceous to Maestrichtian age. Pal (1968) found species of Distichoplax Pia which enjoy universal acceptance as an ideal index fossil for the Palaeocene. Peyssonelia antiqua is essentially a Palaeocene-Eocene form. It was originally described by Johnson (1964) from the Palaeocene limestone of Rowanduz in northern Iraq which unconformably overlie the late Cretaceous (Maestrichtian) strata. In Guatemala the species occurs in the Peten Formation which consists of light-coloured limestones, dolomites and evaporites, in association with Palaeocene foraminiferal species, e.g., Truncorotalia, Globorotalia, Globigerina, etc. (Johnson, 1965).

It may be mentioned in this connection that Palaeocene-Eocene strata occur "in continuity of, and overlying the Cretaceous rocks in the Pondicherry area" (Rama Rao, 1953, p. 76). It may not be out of place to suggest that the sedimentation in the Narbada basin also continued beyond the Cretaceous and possibly through the Palaeocene.

Thanks are due to Dr. J. Harlan Johnson, Emeritus Professor of Geology, Colorado School of Mines, who took much interest in the present work and made valuable suggestions.
2. Chiplonker, G. W., Proc. Ind. Acad. Sci. (B), 1937-41, 6, 1 i 7, 6 ; 9, 6 ; 10, 4; 14, 3.
ON A NEW SPECIES OF *LITHOPORELLA* FOSLIE (CORALLINE ALGAE) FROM THE BAGH BEDS OF MADHYA PRADESH

The present communication reports a new species of *Lithoporella* Foslie from the Upper Coralline Limestones of the Bagh Beds of Madhya Pradesh. Fossil algae from the Bagh Beds have been reported by Chiplonker (1944), Singh (1950), and more recently by Ghosh and Pal (1968, 1969) and Pal (1968).

The term *Lithoporella* was used by Foslie in 1904 (Weber van Bosse and Foslie, p. 73) for thin crustose coralline algae whose thalli are built of one or only a few layers of cells. Foslie (1909, p. 59) raised *Lithoporella* to full generic rank. This was accepted by most American geologists; and Marshall A. Howe (1919, p. 17) states: "Foslie's establishment of a genus *Lithoporella* to receive the monostromatic calcified forms that he had previously referred to *Mastophora* seems justified." However, Mme. Lemoine (1917, p. 174) preferred to consider *Lithoporella* as a subgenus under *Melobesia*.

In recent years, American geologists have tended to follow Howe's example and consider *Lithoporella* as an independent genus, while European geologists and botanists have followed Mme. Lemoine. *Lithoporella* has very thin monostromatic crustose thalli except around conceptacles where they thicken, and several layers of smaller cells may be present. The cells are rectangular, vertically elongated, and form a palisade-like layer. Rhizoids are absent. The thalli commonly grow superimposed or alternating with other crustose algae or encrusting foraminifers to form thick crusts. Conceptacles are large, with a single aperture.

*Lithoporella* closely resembles *Mastophora* Decaisne, but *Mastophora* has long rhizoids for attachment, and normally the thalli do not grow superimposed. Another genus of close resemblance is *Heteroderma* Foslie which differs from *Lithoporella* in consisting of one or two layers of *isodiametric* cells which are not vertically elongated to form palisade-like layers. Adjacent thalli become confluent but never superimposed. *Melobesia* Lamouroux differs from *Lithoporella* by having horizontally elongated cells in the basal layer; the thallus may be several layers thick and the conceptacles have a number of openings.

**Systematic Description**

*Phylum*: RHODOPHYCOPHYTA (Red Algae)

*Family*: CORALLINACEAE (Coralline Algae)

*Subfamily*: MELOBESIODEAE (Crustose Coralline Algae)


*Fig. 1*, x 100.

*Lithoporella indica* n. sp.

Description.—Thallus a single layer of long, vertically elongated, narrow palisade cells which show a considerable range in size in a single thallus. Cells 64-104 \( \mu \text{m} \) high and 16-24 \( \mu \text{m} \) wide. Thickening around conceptacles where 2-3 layers of smaller cells are observed. Conceptacle 240-250 \( \mu \text{m} \) x 160 \( \mu \text{m} \) with a single aperture, 40-48 \( \mu \text{m} \) wide.

Remarks.—Though the cell dimensions are within the great size range of *Lithoporella* *melobesioides* Foslie, the present material differs in having a much higher height/width value of cells, as also in the dimensions of conceptacles which are much smaller. It closely resembles *Lithoporella crassa* Ishijima or *Lithoporella longicella* Johnson, but these are "strictly monostromatic" and show...
Table I

<table>
<thead>
<tr>
<th>Species</th>
<th>Height (m)</th>
<th>Width (m)</th>
<th>Conceptacles Diameter (m)</th>
<th>Conceptacles Height (m)</th>
<th>Age</th>
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The author is indebted to Prof. A. K. Ghosh, Department of Botany, Calcutta University, who suggested the problem and guided the work.

Palaeobotany Laboratory, A. K. Pal, Department of Botany, Calcutta University, Calcutta-19, May 1, 1909.
The author reports a new scaphitid, *Sigmoscanhat*s chiolonkeri gen. et. sp. nov., from the Bagh Beds of the Man river section of M.P. The material was collected from the horizon of brown marl at the top of the white marl which is overlain by the Coralline Limestones and a Maestrichtian age has been assigned to the material.

The acute sigmoid shape of the shell distinguishes the present material from other scaphitids, but the scaphitid affinity is obvious. Shell acute sigmoid, rather ellipticone. Whorls very convex. Ribs on earlier whorls, rather prominent. From each umbilical tubercle arises a rib that joins the ventro-lateral tubercles and on the ventral side the primary ribs are associated with intercalatories, limited to the ventro-lateral part of the whorl. Shaftcompressed free from the base, rather flattened. Shaft-profile passes from ovate in earlier whorls to compressed, trapezoidal; venter smooth. Shaft straight away from the coiled portion. Apperture with lateral lappets. The external sutures consist of 3-4 well-defined lobes and saddles, saddles progressively decreasing in height away from the venter. The saddles are rather asymmetrically. The first lateral saddle is wider than the second. Both lobes and saddles are frilled.

The name of the genus was derived from the acute sigmoid shape; the specific name is after G.W. Chiplonker, D.Sc., a pioneer worker on the fossil fauna of the Bagh Beds.
On some Codiacean algae from the Bagh beds of Madhya Pradesh.
Ajit Kumar Pal.

The author reports certain intermediate fossil forms of calcareous algae belonging to the family Codiaceae from the Bagh Beds of the Lower Narbada valley of M.P. Segmented Codiaceae in the Cretaceous are represented by assemblages of dissociated segments referable to three types: Arabicodium Elliott, Boueina Toula, and Halimeda Lamouroux. However, the present materials show an intermingling of characteristics of all three. From morphological affinities, these may be grouped into two types: (1) Arabicodium-Halimeda species and (2) Boueina-Halimeda species.

Arabicodium-Halimeda species.
Long, narrow segments with slightly wavy longitudinal threads of Arabicodium, but also show cortical threads with constrictions and swellings and triple-branching of the swollen cortical threads, characteristic of Halimeda.

Boueina-Halimeda species.
Branching stems, long and narrow, composed of interwoven tabular threads. The inner threads are irregular, coarse, and they branch repeatedly into smaller and smaller ones, ending in fine, short tubules perpendicular to the surface. The medulla of tangled threads is suggestive of Boueina, while branching of the thallus and constrictions and swellings of the cortical threads is typical of Halimeda.

Contd...
The material is from Coralline Limestones for which a Maestrichtian
to Palaeocene age has been assigned by the author. It may be mentioned
that similar forms are not quite unknown and have been noticed by
Museler (1940), Emberger (1960), Elliott (1965), and Johnson (1967).
Elliott referred to such forms as due to hybridization.