The IR spectra of this glucofructan contained absorption bands at 820, 860, and 940 cm^{-1}, which are characteristic for polysaccharides of the inulin and levan type [8].

The results of IR spectroscopy and the negative specific rotation show a predominance of β-glycosidic bonds in the glucofructans, and the ease of acid hydrolysis is evidence in favor of the furanose form of the D-fructose residues.

Thus, the Cousinia carbohydrates are biopolymers of different natures: ethanol-soluble sugars, water-soluble polysaccharides, pectin substances, and hemicelluloses.

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LIPIDS OF MARINE ORIGIN.

IV. 1,2-DI-O-ALKYLGLYCEROPHOSPHO- AND -PHOSPHONOLIPIDS FROM THE MARINE SPONGE Ectyodoryx kovdaicum

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Phosphonolipids have been found in many prokaryotes and eukaryotes [1], and dialkylglycerols are widely represented in archaebacteria [2]. Neither phosphonolipids nor dialkylglycerophospholipids have previously been found in sponges. Continuing an investigation of lipids of marine origin [3], we have studied the phospholipid composition of the marine sponge Ectyodoryx kovdaicum collected in July-August, 1983, in the White Sea from a depth of 15-80 m:

Class of Phospholipids	Amount, % of lipid phosphorus
1-O-Alkyl-2-acyl-sn-glycero-3-phosphoethanolamine	22.1
1,2-Di-O-alkyl-sn-glycero-3-phosphoethanolamine	1.4
1.O-Alk-1'-enyl-2-acryl-sn-glycero-3-phosphoethanolamine	2.0
1-O-Alkyl-2-acyl-sn-glycero-3-(2-aminoethyl)phosphonate	5.7
1,2-Di-O-alkyl-sn-glycero-3-(2-aminoethyl)phosphonate	2.3
Lysophosphatidylethanolamine	3.0
Phosphatidylserine	21.5
Sum of the aminophospholipids	58.0
Phosphatidylcholine (sum of all forms)	26.1
Phosphatidylglycerol	10.2
Phosphatidylinositol	2.5
Phosphatidic acid	3.2
Phospholipids (% of the total lipids)	27.8

The extraction of the lipids and the preparation of the lipid extracts were carried out as we have described previously [4, 5]. IR spectra were taken on Simadzu IR-435 and Specord-

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80 m instruments. To separate the phospho and phosphono analogs of the lipids we used the method of treatment on silicic acid [6-8]. When the lipid extract from the sponge was eluted with chloroform–methanol (8:2, by volume), a fraction containing the phosphono analog of phosphatidylethanolamine (PE) was obtained, while elution with chloroform–methanol (6:4) gave PE. On TLC in chloroform–methanol–acetic acid–water (100:60:16:8) system, the R_f value of the phosphono analog was 0.80. The IR spectrum of this glycerophosphono lipid confirmed that it contained a P–C bond (680 cm^{-1}).

The amounts of plasmalogen, alkyl-acyl, diacyl, and dialkyl forms were determined in the fractions of the phospho and phosphono analogs obtained, with the aid of a method that we have proposed previously [7]. After mild alkaline and acid hydrolysis [7] of the two fractions of phospho and phosphono analogs separately, we isolated the unsaponifiable components. The IR spectra showed the absence from them of absorption bands of ester bonds characteristic for fatty acid derivatives, but the absorption bands of an ether bnd (C–O–C, 1120 cm^{-1}) were identified.

Thus, it has been established that the fractions of phosphatidylethanolamines contained dialkyl forms of PE and phosphono analogs of alkyl and alkenyl forms of PE.

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