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Two Phaeophytin Type Analogues from Marine Sponge *Dysidea sp*.

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Abstract: A new compound named 13b (*S*)-hydroxy-17c-ethoxypheaophorbide a (**2**) together with a known compound 17c-ethoxypheaophorbide a (**1**) were isolated from marine sponge *Dysidea sp*. collected in South China sea. The structures were elucidated by spectroscopic analysis as well as comparison with those reported in literatures.

Keywords: Marine sponge, *Dysidea sp.*, 17c-ethoxypheaophorbide a, 13b(*S*)-hydroxy-17c-ethoxy-pheaophorbide a.

Phaeophytins and related compounds widely distributed in green plants including marine alga, silkworm, photosynthetic bacteria[1-4]. They play an important role in the transmission and primary light conversion events in photosynthesis. Hitherto a few phaeophytins have been discovered in marine sponges, only *Corallistes sp*. and *Darwinella oxeata* have been reported to contain phaeorphyrin type compounds[5-7]. Previous works revealed that phaeophytins possess potent cytotoxic activities against several solid tumor cell lines[8] and antioxidant activities[9-10]. In the continuous investigation of the bioactive natural products from marine organisms, the marine sponge *Dysidea sp*. was collected from Hainan island, South China sea. The MeOH extract of sponge (560 g) was concentrated in vacuum and then partitioned between CH_2Cl_2 and H_2O. The CH_2Cl_2 fraction was subjected to silica gel column chromatography, eluting with a gradient (petroleum ether-acetone) to yield five fractions. The fractions were tested on tumor cell lines (HL60, PC-3MIE8, BGC-823, Bel-7402, Hela, MDA-MB-435), of which one fraction showed significant cytotoxicities against the selected cell lines. Subsequent separation of the active fraction by repeated silica gel column chromatography and followed by semi-preparative HPLC led to yield compound **1** (3.5 mg) and compound **2** (1.2 mg).

Compound **1** was identified as 17c-ethoxyphaeophorbide a by comparison of its spectral data and physical properties with those reported in literature[10].

Compound **2,** $[\alpha]_D^{25}$-6.51(*c* 0.2, $CHCl_3$), was isolated as a dark brown amorphous solid, and its molecular formula $C_{37}H_{41}N_4O_6$ was established by HRFABMS (*m/z* 637.3026 $[M+H]^+$, calcd. for $C_{37}H_{40}N_4O_6$, 637.3026). IR absorptions at 3429, 1737, 1706 and 1616

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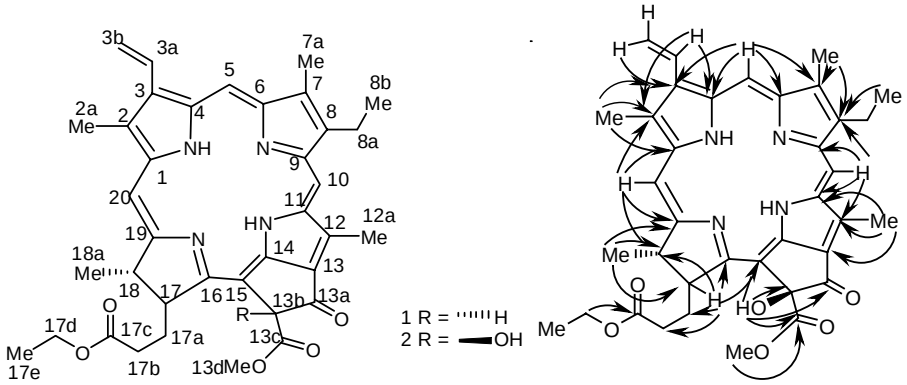
cm^{-1} suggested the presence of hydroxyl, carbonyl and vinyl groups. Its ^{1}H and ^{13}C NMR data (**Table 1**) closely resembled those of compound **1**. In ^{1}H NMR spectrum, there are seven methyls at δ3.45 (s, H-2a), 3.30 (s, H-7a), 1.71 (t, J=7.5 Hz, H-8b), 3.66 (s, H-12a), 3.76 (s, OMe), 1.14 (t, J=7.0 Hz, H-17e) and 1.63 (d, J=7.0 Hz, H-18a); three olefinic singlets at δ9.51 (s, H-5), 9.65 (s, H-10), and 8.66 (s, H-20); one mono- substituted vinyl group at δ8.06 (dd, J=17.5, 11.5 Hz, H-3a), 6.31 (brd, J=17.5 Hz, H-3b1) and 6.20 (brd,

Table 1 ^{1}H and ^{13}C NMR of compounds **1** and **2** (500 MHz, in $CDCl_3$ δ ppm)

No.	**1**		**2**	
	δ_H	δ_C	δ_H	δ_C
1		142.1		144.8
2		133.0		131.9
2a	3.41, s	12.13	3.45, s	12.5
3		136.3		137.3
3a	8.01, dd (17.5, 11.5)	129.1	8.06, dd (17.5, 11.5)	129.4
3b1	6.30, brd (17.5)	122.8	6.31,brd (17.5)	123.8
3b2	6.19, brd (11.5)		6.20, brd (11.5)	
4		136.2		137.2
5	9.41, s	97.6	9.51, s	98.4
6		155.0		155.6
7		136.5		137.2
7a	3.24, s	11.27	3.30, s	11.7
8		145.2		145.4
8a	3.69, q (7.5)	19.5	3.72, q (7.5)	20.0
8b	1.72, t (7.5)	17.4	1.71, t (7.5)	17.7
9		151.7		151.9
10	9.55, s	104.5	9.65, s	104.8
11		137.9		138.4
12		129.1		129.4
12a	3.70, s	12.1	3.66, s	12.8
13		129.1		127.1
13a		189.6		192.2
13b	6.27, s	64.7		89.5
13c		169.6		173.9
13d	3.88, s	52.9	3.76, s	53.9
14		149.7		150.0
15		105.2		104.9
16		161.3		163.1
17	4.22, m	51.1	4.16, m	52.5
17a	2.62, 2.34, m	29.8	2.29, m	31.6
17b	2.48, 2.18, m	31.2	2.92, 2.52, m	32.0
17c		172.9		173.9
17d	4.02, q (7.0)	60.5	4.10, q (7.0)	63.3
17e	1.12, t (7.0)	14.1	1.14, t (7.0)	14.5
18	4.48, m	50.1	4.50, m	50.9
18a	1.82, d (7.0)	23.1	1.63, d (7.0)	23.1
19		172.2		173.3
20	8.58, s	93.2	8.66, s	95.1
13b-OH			5.55, brs	

Figure 1 The structures of **1** and **2** and main HMBC correlation of **2**



J=11.5 Hz, H-3b2), as well as one D_2O exchangeable signal at δ 5.55 (brs.). Compound **2** differed from **1** in the position C-13b, where a proton H-13b (δ 6.27, s) in **1** was replaced by a hydroxyl group in **2**, which was supported by a quaternary carbon at δ 89.5 (s) in the ^{13}C NMR spectrum of **2** instead of a methine carbon at δ 64.7 (d, C-13b) of **1**. In the HMBC spectrum of **2** (see **Figure 1**), the long range correlations of the exchangeable proton (δ 5.55, brs) with C-13a (δ 192.2, s), C-13b (δ 89.5, s), C-13c (δ 173.9, s) and C-15 (104.9, s) further confirmed the location of hydroxyl group. The configuration at chiral center C-13b in **2** was determined as *S* due to the up-field chemical shift of H-17 (δ 4.16, m)[11,12]. Accordingly, the structure of compound **2** was identified as 13b(*S*)-hydroxy-17c-ethoxypheaophorbide a.

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