Investigating the Hepatoprotective Potentiality of Marine-Derived Steroids as Promising Inhibitors of Liver Fibrosis

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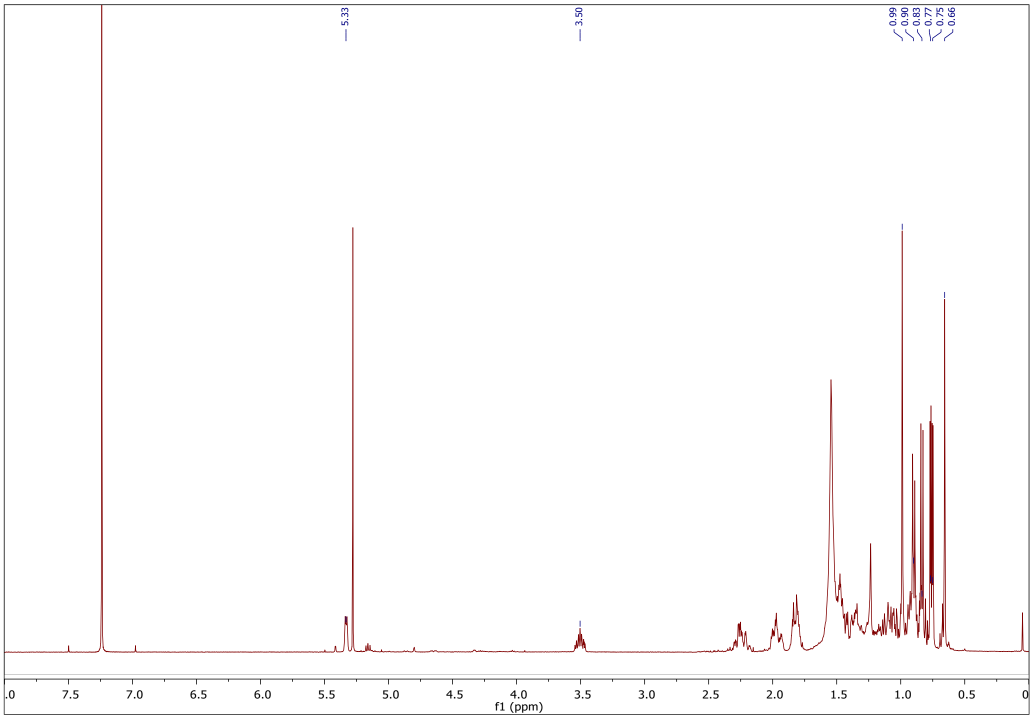


Fig. S1 ^{1}H NMR spectrum of 24*S*-methyl-cholest-5-en-3*β*-ol (**1**) in $CDCl_3$.

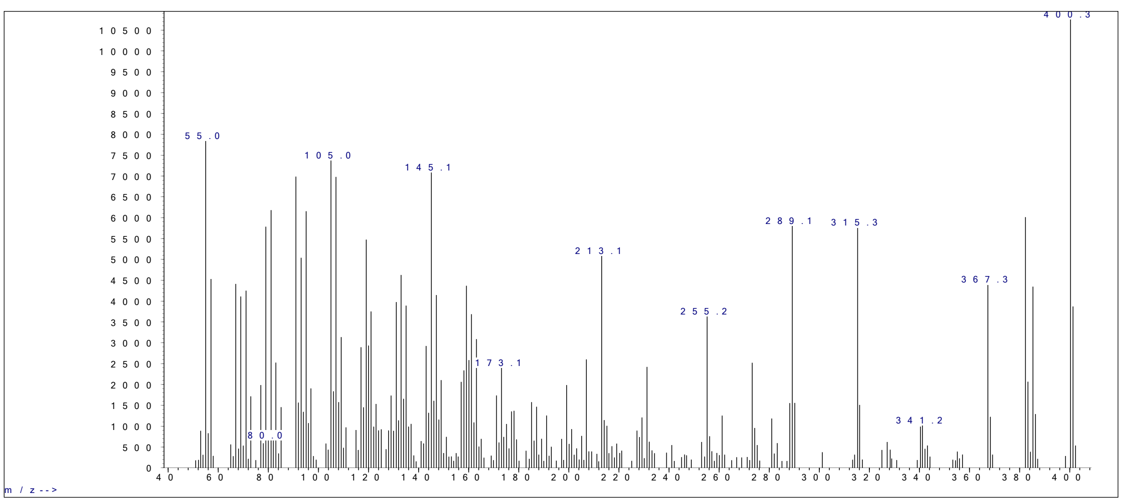


Fig. S2 ESIMS spectrum of 24*S*-methyl-cholest-5-en-3β-ol (**1**).

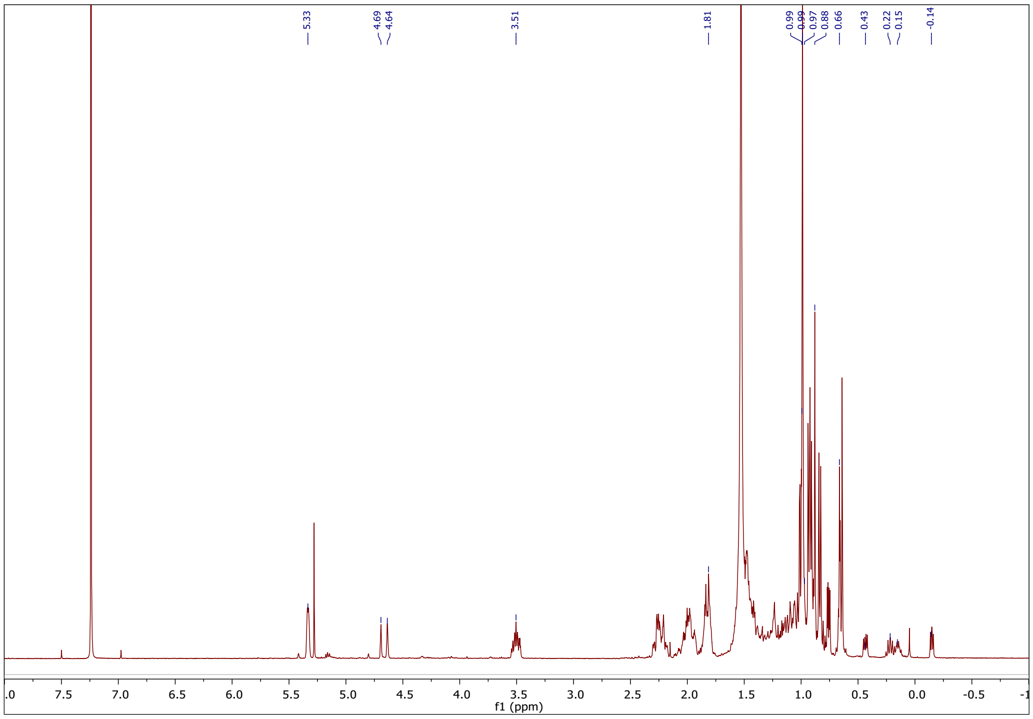


Fig. S3 ^{1}H NMR spectrum of gorgostan-5,25-dien-3*β*-ol (**2**) in $CDCl_3$.

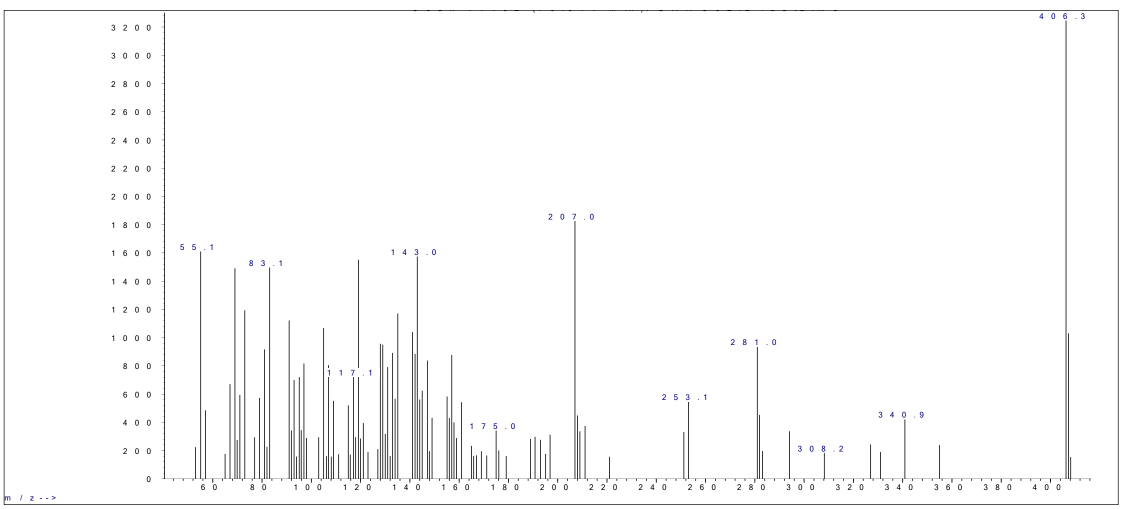


Fig. S4 ESIMS spectrum of gorgostan-5,25-dien-3*β*-ol (**2**).

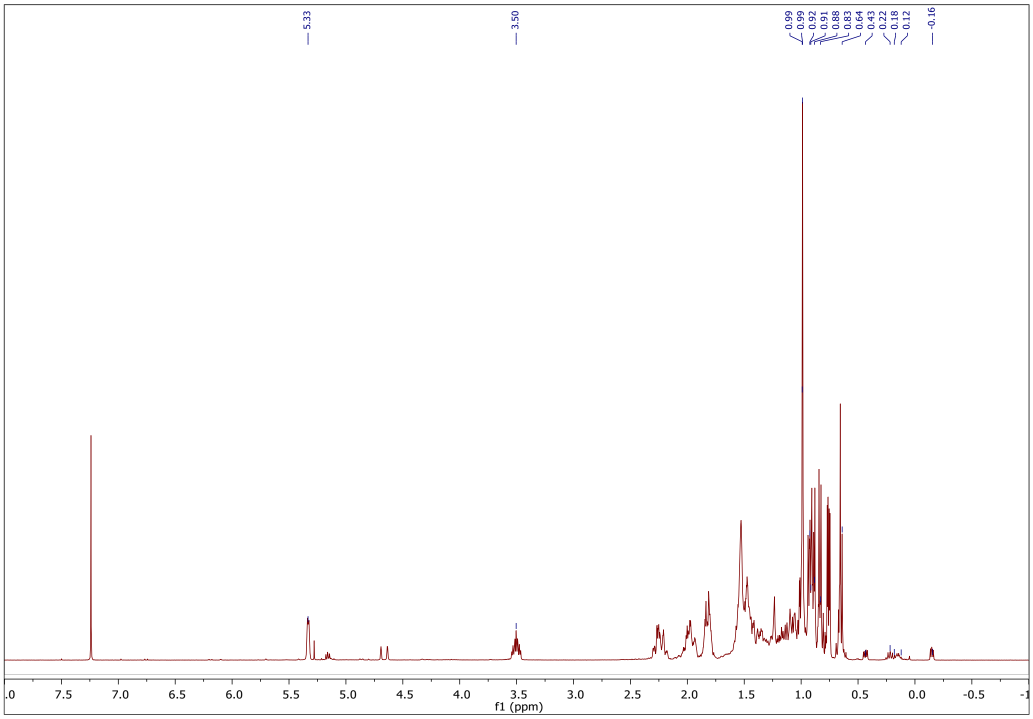


Fig. S5 ^{1}H NMR spectrum of gorgosterol (**3**) in $CDCl_3$.

Figure S6. ESIMS spectrum of gorgosterol **(3)**.

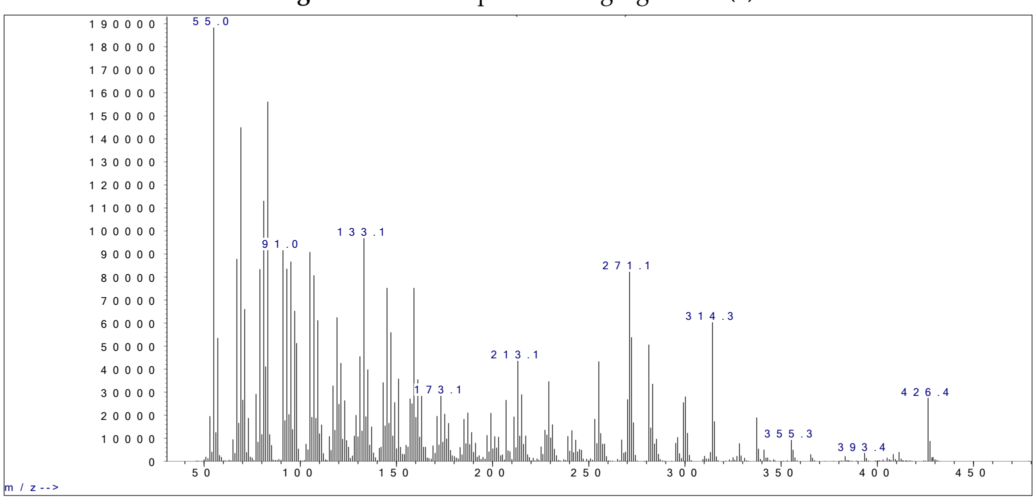
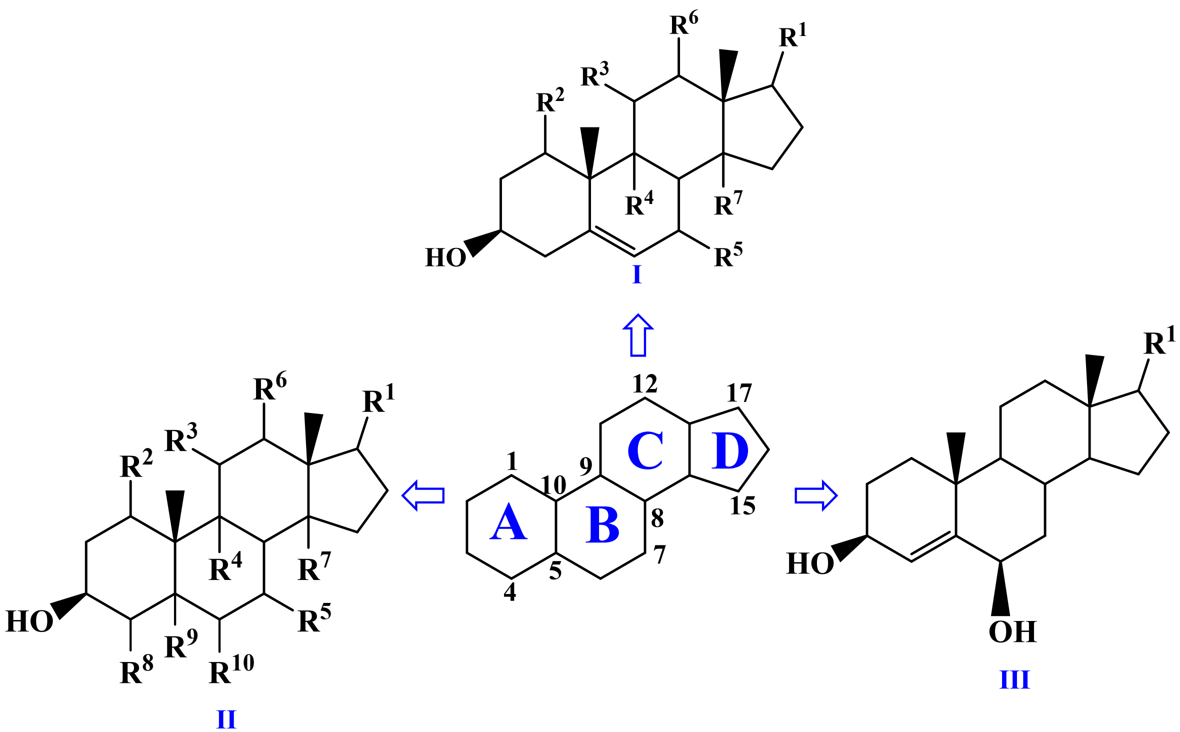
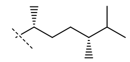
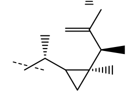
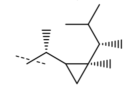
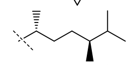
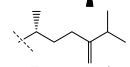
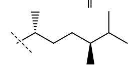
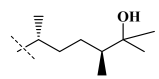
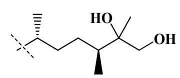


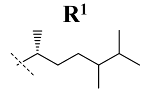
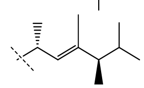
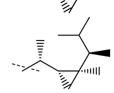
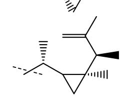
Fig. S6 ESIMS spectrum of gorgosterol (**3**).

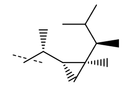
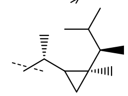
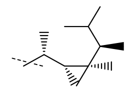
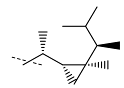
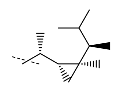
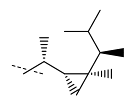
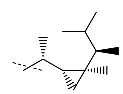
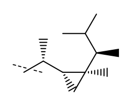


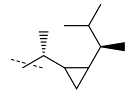
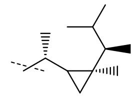
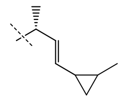
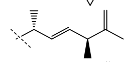
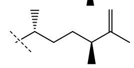
All the steroids isolated possess a fused tetracyclic ring system with three six-membered rings and a five-membered ring as a common scaffold from core I, II or III, **Scheme S1.** The six-membered rings of the carbon skeleton are designated as A, B, C, and the five-membered as D. They all have two methyl groups and an eight- to eleven-carbon side chain at C-10, C-13 and C-17, respectively. The fused tetracyclic ring system and the side chain at C-17 are densely decorated by hydroxyl and methyl groups. The 4,5-bond on ring A and 5,6-bond on ring D can be either saturated or unsaturated.

Scheme S1. Reported steroid derivatives (**1-26**)

#	Core	Source, [Ref]	Name	R¹	R²	R³	R⁴	R⁵	R⁶	R⁷	R⁸	R⁹	R¹⁰
1	I	soft coral[a] *Lobophytum crissum*, [1]	24*S*-methyl-cholest-5-en-3*β*-ol		H	H	H	H	H	H	--	--	--
2	I	soft coral[a] *Lobophytum lobophytum*, [2]	gorgostan-5,25-dien-3*β*-ol		H	H	H	H	H	H	--	--	--
3	I	soft coral[a], *Lobophytum crissum*, [1]	gorgosterol		H	H	H	H	H	H	--	--	--
4	I	*Euphorbia pulcherimma*, [3]	24*R*-methyl-cholest-5-en-3*β* -ol		H	H	H	H	H	H	--	--	--
5	I	*Sinularia polydactyla* [4]	24-methyl-cholesta-5,24-dien-3*β*-ol		H	H	H	H	H	H	--	--	--
6	I	*Sinularia* sp., [5]	24*S*-methyl-cholest-5-en-1*α*,3 *β* -diol		*α*-OH	H	H	H	H	H	--	--	--
7	I	*Sarcophyton glaucum* [6]	24*S*-methyl-cholest-5-en-3*β*,25-diol		H	H	H	H	H	H	--	--	--
8	I	*Sarcophyton glaucum* [6]	24S-methyl-cholest-5-en-3*β*,25*ξ*,26-triol		H	H	H	H	H	H	--	--	--

#	Core	Source	Name	R¹	R²	R³	R⁴	R⁵	R⁶	R7	R⁸	R⁹	R¹⁰
9	I	*Sinularia dissecta*, [7]	24*ξ*-Methyl-cholest-5-en-1*α*,3*β*,11*α*-triol		*α*-OH	*α*-OH	H	H	H	H	--	--	--
10	II	*Sarcophyton glaucum*, [8]	dinosterol		H	H	H	H	H	H	CH_3	H	H
11	I	*Plexaurella grisea*, [9]	9*α*-hydroxygorgosterol		H	H	*α*-OH	H	H	H	--	--	--
12	I	*Plexaurella grisea*[9]	11*α*-hydroxygorgosterol		H	*α*-OH	H	H	H	H	--	--	--
13	I	*Sinularia numerosa*, [10]	7*β*-hydroxygorgosterol		H	H	H	*α*-OH	H	H	--	--	--

14	I	*Klyxum flaccidum*, [11]	klyflaccisteroids G		H	*α*-OH	H	*α*-OH	H	H	--	--	--
15	I	*Sinularia dissecta*, [7]	1*α*,11*α*-dihydroxygorgosterol		*α*-OH	*α*-OH	H	H	H	H	--	--	--
16	I	*Klyxum flaccidum*, [11]	klyflaccisteroids H		H	*α*-OH	H	*α*-OH	*α*-OH	H	--	--	--
17	I	*Klyxum flaccidum*, [11]	klyflaccisteroids I		H	*α*-OH	H	*α*-OH	H	H	--	--	--
18	I	*Plexaurella grisea*, [9]	9*α*,11*α*,14*α*-trihydroxygorgosterol		H	*α*-OH	*α*-OH	H	H	*α*-OH	--	--	--
19	II	*Sarcophyton ehrenbergi*, [12]	ehrensteroid F		*α*-OH	H	H	H	H	H	H	*α*-OH	*β*-OH
20	II	*Sarcophyton ehrenbergi*, [12]	lobophysterol D		H	*α*-OH	H	H	*α*-OH	H	H	*α*-OH	*β*-OH
#	**Core**	**Source**	**Name**	**R^1**	**R^2**	**R^3**	**R^4**	**R^5**	**R^6**	**R7**	**R^8**	**R^9**	**R^{10}**
21	II	*Sarcophyton ehrenbergi*, [12]	sarcoaldesterol A		H	*α*-OH	H	H	H	H	H	*α*-OH	*β*-OH

22	I	*Sinularia dissecta*, [7]	1*α*,11*α*-dihydroxy-23-demethylgorgosterol		*α*-OH	*α*-OH	H	H	H	H	--	--	--
23	III	*Sinularia dissecta*, [13]	dissesterol		--	--	--	--	--	--	--	--	--
24	I	*Sarcophyton glaucum*, [14]	glaucasterol		H	H	H	H	H	H	--	--	--
25	I	*Sarcophyton glaucum*, [8]	22-dehydrocodisterol		H	H	H	H	H	H	--	--	--
26	I	*Sarcophyton glaucum*, [8]	codisterol		H	H	H	H	H	H	--	--	--

[a] Steroidal compound recovered here in the current work from the crude extract of soft coral, the crude extract was tested *in vivo* as a hepatoprotective agent.

Table S1. Calculated free binding energies (ΔG_B, in kcal/mol) of the focused library of 26 steroid derivatives (**1-26**) for GST and HSD.

Steroid derivatives	**ΔG_B, in kcal/mol**	
	GST	**HSD**
1[a]	-7.7	-7.8
2[a]	-8.4	-8.2
3[a]	-8.4	-8.8
4	-8.5	-8.5
5	-7.0	-7.9
6	-8.5	-8.1
7	-7.5	-8.1
8	-8.0	-7.8
9	-7.2	-8.2
10	-8.9	-8.7
11	-8.8	-8.6
12	-8.9	-9.1
13	-9.1	-9.0
14	-9.3	-9.4
15	-8.9	-8.1
16	-8.4	-9.0
17	-9.3	-8.7
18	-8.9	-8.8
19	-8.8	-7.9
20	-8.3	-7.9
21	-8.6	-9.1
22	-8.6	-8.5
23	-8.6	-8.4
24	-9.1	-9.1
25	-8.7	-8.8
26	-8.0	-8.3

[a]The steroid derivatives recovered experimentally in current work.

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