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Investigation of a number of synthetic routes to aza analogues of Morphactins led to the synthesis of (*RS*)-methyl 5*H*-5-hydroxyindeno[1,2-*b*]pyridine-5-carboxylate (**6e**) and the corresponding carboxamide, **6f**.

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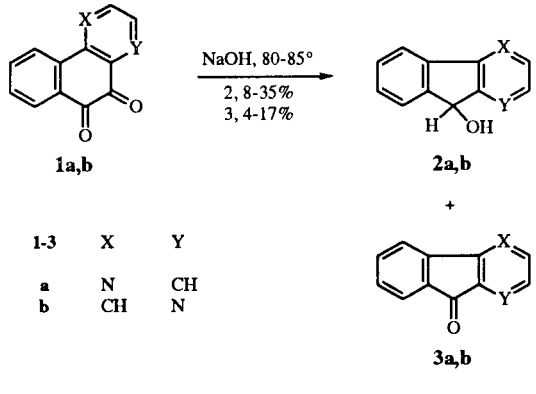
Morphactins are derivatives of 9-hydroxyfluorene-9-carboxylic acid which possess plant growth regulating activity [1]. A number of synthetic routes to aza analogues of these compounds have been investigated, leading to the synthesis of (*RS*)-methyl 5*H*-5-hydroxyindeno[1,2-*b*]pyridine-5-carboxylate (**6e**) and the corresponding amide. Investigations, such as these, in the relatively unexplored field of indenopyridine chemistry have recently been given more impetus by the finding that several species of *Annonaceae* produce indenopyridine alkaloids [2], one of which possesses anticandidal activity [3]. Friedlander [4] prepared 9-hydroxyfluorene-9-carboxylic acid by heating phenanthrene-9,10-dione with hot alkali when it underwent the benzil-benzilic acid rearrangement. In the present work, however, when benzo[*h*]quinoline-5,6-dione (**1a**) was heated with alkali, only (*RS*)-5-hydroxy-5*H*-indeno[1,2-*b*]pyridine (**2a**) could be isolated (35% yield) together with a small amount (4%) of 5*H*-indeno[1,2-*b*]pyridin-5-one (**3a**); benzo[*f*]-quinoline-9,10-dione (**1b**) similarly gave (*RS*)-9*H*-9-hydroxyindeno[2,1-*b*]pyridine (**2b**) and the corresponding ketone **3b** in yields of 8% and 17%, respectively (Scheme I). These results suggest that the expected α-hydroxyacids were formed but underwent decarboxylation and that the decarboxylation products were partially oxidized [5].

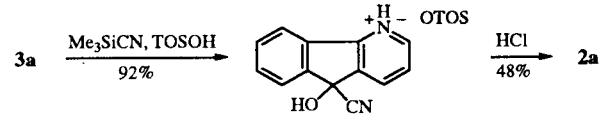
Scheme I



1-3	X	Y
a	N	CH
b	CH	N

In an alternative approach to the synthesis of the required indenopyridines 5*H*-indeno[1,2-*b*]pyridin-5-one (**3a**) was allowed to react with trimethylsilylcyanide in the presence of a phase transfer catalyst [6]. Treatment of the adduct which resulted with toluene-4-sulfonic acid gave (*RS*)-5*H*-5-cyano-5-hydroxyindeno[1,2-*b*]pyridine (**4**), as the toluene-4-sulfonate, in 92 % yield. An attempt to convert the hydroxycyanide to the corresponding 5-carboxylic acid by hydrolysis failed; only decarboxylated material, (*RS*)-5*H*-5-hydroxyindeno[1,2-*b*]pyridine (**2a**), was isolated (Scheme II).

Scheme II



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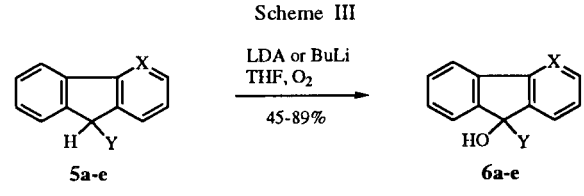
A successful route to the required compounds was finally devised, based on the hydroxylation of enolate anions as described by Vedejs and others [7] (Scheme III). Since none of the published examples of this type of hydroxylation involved pseudo-aromatic anions, preliminary investigations were conducted using fluorene derivatives as model compounds. It was found that ethyl fluorene-9-carboxylate (**5a**) could be converted to the 9-hydroxy derivative **6a** in 49% yield by oxidizing the 9-anion with oxodiperoxopyridinohexamethylphosphorimidomolybdenum(VI) [7]; oxidation using molecular oxygen [8] increased the yield to 80%.

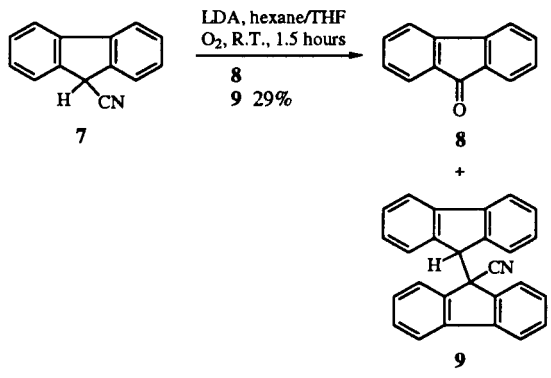
Scheme III



5-6	X	Y
a	CH	CO_2Et
b	CH	CO_2Me
c	CH	CO_2H
d	CH	$CONMe_2$
e	N	CO_2Me

The methyl ester **5b** similarly gave a good yield (89%) of the 9-hydroxy derivative **6b**. Fluorene-9-carboxylic acid (**6c**) and fluorene-9-*N*,*N*-dimethylcarboxamide (**6d**) were also hydroxylated successfully, but fluorene-9-carbonitrile (**7**) gave 36% of fluoren-9-one (**8**) and 29% of 9,9'-bifluorene-9-carbonitrile (**9**) (Scheme IV). The former product

Scheme IV



presumably arose by elimination of hydrogen cyanide from an α-hydroxynitrile. The latter product, which was identified by comparison with an authentic specimen, could have resulted from nucleophilic attack by the anion derived from fluorene-9-carbonitrile on the carbonitrile itself. The results of these experiments are summarised in Table I.

direct synthesis of protected derivatives of the carboxylic acid. Methyl fluorene-9-carboxylate has been prepared by photolytic Woolf rearrangement, in methanol, of the diazoketone derived from phenanthrene-9,10-dione [9]. When, however, the diazoketone **10** derived from benzo[*h*]quinoline-5,6-dione (**1a**) was photolysed in methanol 5,5'-bis(methyl-5*H*-indeno[1,2-*b*]pyridine-5-carboxylate) (**11**) was formed in

Scheme VI

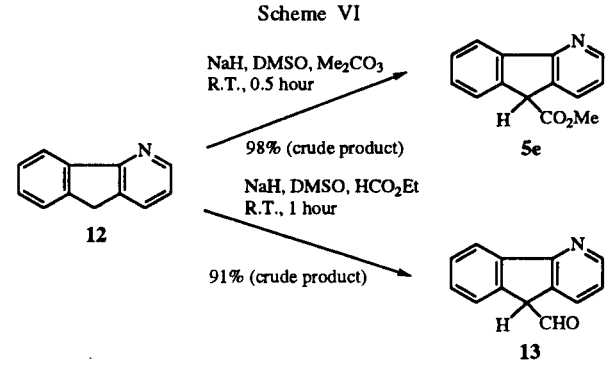


Table I

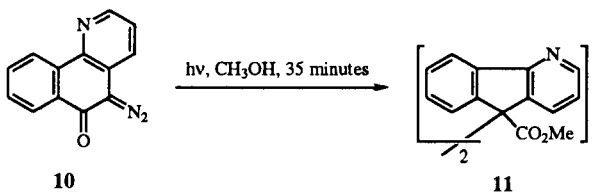
Preparation of Hydroxylated Fluorenes. Reaction Conditions and Results

Product	Base	Temperature (°C) Anion formation	Oxygenation	Duration of Oxygenation (h)	Yield (%)	mp (°C)	Lit mp (°C)	IR (KBr) ν (cm^{-1})
6a	LDA	-78	-78, then rt	0.75	80 [a]	92-95	92-96 [16]	3475 (OH), 1730 (C=O)
6b	LDA	-32	-32, then rt	6 2.5	72 [b] 89	161-163 160-162	160	3495 (OH), 1730 (C=O)
6c	LDA	0-5 then 40-50°	rt	18	83	166-167(d)	164-166	3440 (OH), 1720 (C=O)
6d	*n*-BuLi	-10	-10, then rt	2.5	45	120-122	121.5-122 [17]	3396, 3310 (HO) 3070, 3050 (CH_3) 1630 (C=O)

[a] plus 9% α-hydroxy acid. [b] plus 18% α-hydroxy acid.

(*RS*)-5*H*-indeno[1,2-*b*]pyridine-5-carboxylic acid, which was required in order to extend the hydroxylation studies, could not be prepared satisfactorily by carbonylation of 5*H*-indeno[1,2-*b*]pyridine in the presence of a strong base. The crude acid was obtained as its hydrochloride salt but underwent decarboxylation during attempts to recrystallise it from protic solvents. Attention was therefore turned to the

Scheme V



45% yield (Scheme V). The required methyl ester **5e** was eventually obtained by treating 5*H*-indeno[1,2-*b*]pyridine (**12**) with 4 equivalents of dimethyl carbonate in the presence of 1.5 equivalents of methylsulphinylmethide [10,11]. The ester was obtained as a red oil which was purified by preparative tlc. A similar reaction using ethyl methanoate as the acylating agent gave a high yield of (*RS*)-5*H*-indeno[1,2-*b*]-pyridine-5-carbaldehyde (**13**) (Scheme VI). (*RS*)-Methyl 5*H*-indeno[1,2-*b*]pyridine-5-carboxylate (**5e**) was successfully hydroxylated in the 5-position using the method employed for the homocyclic esters; the average yield of **6e** from four preparations was 85%. Ammonation of the ester gave the corresponding amide (81% yield).

None of the indenopyridines described here exhibited significant plant growth regulatory or herbicidal activities.

EXPERIMENTAL

Benzo[*f*]quinoline, benzo[*h*]quinoline and 5*H*-indeno[1,2-*b*]-pyridine (4-azafluorene) were obtained from Aldrich Chemical Co. Ltd., Gillingham, Dorset, U.K., Melting points were determined in open glass capillary tubes using an Electrothermal melting apparatus and are uncorrected. The ir spectra were recorded using a Perkin Elmer 298 or 357 grating spectrophotometer. The ^{1}H nmr spectra and mass spectra were recorded by Schering AG, Chesterford Park, Saffron Walden, U.K. using a 300 MHz Bruker spectrometer with TMS as internal standard and a Finnigan-MAT-44 quadrupole or a VG Analytical-7070E mass spectrometer, respectively.

Benzo[*h*]quinoline-5,6-dione (**1a**).

A solution of benzo[*h*]quinoline (13.4 g, 75 mmoles) and iodine pentoxide (26.2 g) in glacial acetic acid (300 ml) was heated under reflux for 2 hours. The solvent was evaporated, the crude product dried (16 hours, 50°), and then extracted with chloroform (280 ml) for 24 hours using a Soxhlet apparatus. The chloroform solution was washed with sodium thiosulphate solution (10% w/v, 100 ml) and then with water (2 x 500 ml); the combined aqueous washes were then back-extracted with chloroform (50 ml). The combined chloroform solutions were dried (sodium sulphate) and evaporated and the crude dione recrystallized from ethanol, yield 8.2 g (52%), mp 216-217° dec (lit [12] mp 214-215° dec); ms: (70 eV) m/z (%) 209 (8), 181 (100), 153 (51), 127 (37), 126 (36); ir (potassium bromide): ν 1690, 1675 (C=O) cm^{-1}.

Benzo[*f*]quinoline-9,10-dione (**1b**).

The dione was prepared from benzo[*f*]quinoline (19 g, 106 mmoles) as described for benzo[*h*]quinoline-5,6-dione, and recrystallized from cyclohexanone-hexane, yield 10.8 g (49%), mp 267-270° dec (lit [12] mp 270-271° dec); ms: (70 eV) m/z (%) 209 (21), 182 (15), 181 (100), 153 (44), 127 (24), 126 (11); ir (potassium bromide): ν 1685, 1670 (C=O) cm^{-1}.

Action of Alkali on Benzoquinolinediones **1a**, **1b**.

Benzo[*h*]quinoline-5,6-dione (**1a**, 10.45 g, 50 mmoles) was added to a stirred solution of sodium hydroxide (10% w/v, 400 ml) maintained at 80-85° under an atmosphere of nitrogen. After 30 minutes the reaction mixture was cooled and extracted with dichloromethane (3 x 250 ml). The solvent was removed from the dry extract to yield 5*H*-indeno[1,2-*b*]pyridin-5-one (**3a**, 0.35 g, 4%), mp 140-142°, undepressed by addition of an authentic specimen [12]. The *p*H of the aqueous phase was adjusted to 8.3 by addition of sodium hydrogen carbonate and the solution extracted with dichloromethane (3 x 250 ml). The solvent was removed and the residue recrystallized from toluene/methanol to give (*RS*)-5*H*-5-hydroxyindeno[1,2-*b*]pyridine (**2a**), yield 3.2 g (35%), mp 150-152°, undepressed on admixture with material prepared as described below.

A similar reaction with benzo[*f*]quinoline-9,10-dione (**1b**), gave 9*H*-indeno[2,1-*b*]pyridin-9-one (**3b**), yield 1.56 g (17%), mp 125-127°, undepressed by addition of an authentic specimen [12] and (*RS*)-9-hydroxy-9*H*-indeno[2,1-*b*]pyridine (**2b**); yield 0.73 g (8%), mp 97-99°, undepressed by addition of an authentic specimen [13].

(*RS*)-5*H*-5-Hydroxyindeno[1,2-*b*]pyridine (**2a**).

5-*H*-Indeno[1,2-*b*]pyridin-5-one (**3a**, 5.0 g, 27.8 mmoles) was dissolved in 2-propanol (200 ml) and THF (30 ml). The solution was stirred and maintained at 60-70° and a slurry of sodium borohydride (0.6 g, 15.8 mmoles) in THF (19 ml) was then added. After 2.5 hours the volume of the reaction mixture was reduced to about 200 ml and the residue poured into ice-cold water (250 ml). The solid product was collected, washed with ether and dried *in vacuo*. Recrystallization from toluene:methanol (1:1) gave the title compound **2a**, yield 4.32 g (85%), mp 150-152°; ms: (70 eV), m/z (%) 183 (100), 182 (92), 154 (33), 127 (37), 77 (30); ir (potassium bromide): ν 3320 (HO) cm^{-1}; ^{1}H-nmr (DMSO-d_6): δ 5.53 (d, 1H, J = 5.3 Hz, H-5), 5.92 (d, 1H, J = 4.1 Hz, HO-5 resonance is lost on addition of deuterium oxide), 7.2-8.0 (m, 6H, H 3,4,6,7,8,9), 8.52 (d+fs, 1H, J = 2.7 Hz, H-2).

Anal. Calcd. for $C_{12}H_9NO$: C, 78.7; H, 4.95; N, 7.65. Found: C, 78.9; H, 4.95; N, 7.45.

(*RS*)-5*H*-5-Cyano-5-hydroxyindeno[1,2-*b*]pyridinium Toluene-4-sulphonate (**4**).

Cyanotrimethylsilane (1.78 ml, 13.3 mmoles) was injected, through a septum, into a solution of 5*H*-indeno[1,2-*b*]pyridin-5-one (**3a**, 1.5 g, 8.3 mmoles) in benzene (4.5 ml) containing 18-crown-6/cyanide phase transfer catalyst [14] (6 mg). The solution was continuously purged with nitrogen, stirred and maintained at 65° while being protected from moisture. After 78 hours the solution was cooled to 4° and toluene-4-sulphonic acid (1.74 g, 13.3 mmoles) dissolved in 1-butanol (15 ml) added. The precipitate which formed was collected, washed with benzene (15 ml), then with 1-butanol (8 ml) and recrystallised from DMF: 1-butanol (1:2) to give the pure pyridinium salt **4**, yield 2.48 g (92%), mp 196-199° dec; ms: (70 eV) m/z (%) 208 (86), 191 (30), 181 (100), 172 (81), 153 (64), 127 (22), 107 (30), 91 (100); ir (potassium bromide): ν 3180 (OH), 2215 (CN) cm^{-1}.

Anal. Calcd. for $C_{20}H_{16}N_2O_4S$: C, 63.2; H, 4.2; N, 7.4. Found: C, 62.9; H, 4.7; N, 7.6.

Hydrolysis of (*RS*)-5*H*-5-Cyano-5-hydroxyindeno[1,2-*b*]pyridine (**4**).

5*H*-Indeno[1,2-*b*]pyridin-5-one (**3a**, 2.5 g, 13.8 mmoles) was treated with cyanotrimethylsilane (2.0 ml, 15.8 mmoles) in the presence of phase transfer catalyst (10 mg) as previously described. After 20 hours acetone (45 ml) and 2M hydrochloric acid (5 ml) were added and the solution stirred for 2 hours. The solvent was removed and the residue dissolved in 2M hydrochloric acid (5 ml), water (35 ml) and methanol (15 ml). The solution was maintained at 60° for 4 hours and then extracted with dichloromethane (15 ml). The *p*H of the aqueous phase was adjusted to 6 with sodium hydrogen carbonate and the precipitate which separated was extracted into dichloromethane: chloroform (2:1, 75 ml). The solvent was removed from the dry extract and the residue was recrystallised from toluene:methanol (1:1) to give (*RS*)-5*H*-5-hydroxyindeno[1,2-*b*]pyridine (**2a**), yield 1.2 g (48%), mp 151-153°, undepressed on admixture with authentic material prepared as described above.

α-Hydroxylation of Derivatives of Fluorene-9-carboxylic Acid. Typical Procedure [8]: Ethyl 9-Hydroxyfluorene-9-carboxylate (**6a**).

A solution of ethyl fluorene-9-carboxylate [15] (**5a**, 2.0 g, 8.4 mmoles) in anhydrous THF (15 ml) was added to a stirred solu-

tion of lithium diisopropylamide (10 mmoles) in dry hexane (30 ml) maintained at -78°. More THF (30 ml) was added to suspend the solid which separated. A stream of dry oxygen was then passed through the stirred suspension while the temperature was allowed to rise to room temperature. After 40 minutes the mixture was washed with sodium sulphite solution (10% w/v, 2 x 50 ml). The solvent was removed from the dry organic phase and the residue was recrystallised from ethanol to give **6a**, yield 1.7 g (80%), mp 92-95°, (lit [16] 92-96°); ir (potassium bromide): ν 3475 (HO), 1730 (C=O) cm^{-1}. The aqueous phase left from the extraction was acidified with 2M hydrochloric acid and then extracted with chloroform (2 x 50 ml). Evaporation of the dry extract gave the α-hydroxy acid **6c**, yield 0.17 g (9%), mp 163-165°, undepressed on admixture with an authentic specimen [16]; ir (potassium bromide): ν 3440 (HO), 1720 (C=O) cm^{-1}.

Attempted Hydroxylation of Fluorene-9-carbonitrile (**7**).

A solution of fluorene-9-carbonitrile [11] (**7**, 2.8 g 14.6 mmoles) in THF (50 ml) was added, dropwise, to a stirred solution of lithium diisopropylamide (16 mmoles) in hexane (20 ml). A stream of oxygen was then passed through the reaction mixture for 1.5 hours. The volume of the mixture was reduced to approximately 30 ml, ether (80 ml) was added and the solution then washed with a solution of sodium sulphite (10% w/v, 2 x 50 ml). The aqueous washes were back extracted with ether (30 ml). The combined ether solutions were dried and evaporated. The residue (2.3 g) was recrystallised from toluene to give 9,9'-bifluorene-9-carbonitrile (**9**), yield 0.8 g (29%), mp 233-236° undepressed on admixture with an authentic specimen prepared using the method of Clavalla *et al.* [18]. The recrystallisation liquors were evaporated and the residue recrystallised from toluene to give starting material, yield 0.28 g (10%) mp 150-152°, undepressed on admixture with authentic material. The liquors from this recrystallisation after removal of the solvent gave, in turn, impure fluoren-9-one (**8**), yield 0.9 g (36%), mp 76-80°, undepressed on admixture with authentic material [19].

Benzo[*h*]quinoline-5,6-diazoketone (**10**).

Benzo[*h*]quinoline-5,6-dione (**1a**, 2.1 g, 10 mmoles) was suspended in a stirred solution of toluene-4-sulphonylhydrazide [20] (1.91 g, 10.3 mmoles) in ethanol (40 ml) and the mixture was heated at 40-50° for 65 minutes. The mixture was cooled and the solid material which separated was collected by filtration and recrystallised from methanol to give the diazoketone, yield 1.72 g (78%), mp 145-148° dec; ir (potassium bromide): ν 2110 (N_2), 1640 (C=O) cm^{-1}; ms: (70 eV) m/z (%) 221 (6), 193 (32), 166 (14), 165 (100), 164 (56), 139 (16), 138 (40), 137 (14), 88 (10), 87 (10), 86 (8), 82 (12), 69 (24).

(*RS*)-5,5'-Bis(methyl-5*H*-Indeno[1,2-*b*]pyridine-5-carboxylate) (**11**).

Benzo[*h*]quinoline-5,6-diazoketone (**10**, 300 mg, 1.4 mmoles) was dissolved in THF (120 ml) and methanol (70 ml). The solution was deoxygenated (nitrogen purge) and then photolyzed for 35 minutes using a Hanovia photochemical reactor, model PCRIL. The reaction mixture was treated with charcoal (1.0 g) and filtered. The solvent was removed and the residue was purified by flash chromatography [21] (stationary phase: kieselgel 60, 230-400 mesh, 50 g), mobile phase: ethyl acetate, 60-80° petrol (2:3), fraction volume = 12 ml). Fractions 12-23 were combined and the solvents removed. The residue (140 mg, mp 198-201°) was recrystallised from ethyl acetate/60-80 petrol (2:1) to provide the dimer **11**, mp 206-207°; ir (potassium bromide): ν 3060, 3040, 2960 (m, CH), 1729 (C=O), 1585, 1575 (C=C,C=N) cm^{-1}; ms: (70 eV) m/z (%) 448 (7), 225 (18), 224 (81), 197 (13), 196 (100), 181 (45), 167 (11), 166 (27), 165 (29), 164 (19), 139 (10), 138 (15); ^{1}H-nmr (deuteriochloroform): δ 3.81 (s, 6H, OCH_3), 6.83 (m, 2H, Ar), 6.95-7.04 (m, 2H, Ar), 7.14-7.47 (m, 6H, Ar), 7.75 (d, 1H, J = 8.43 Hz, H-3'), 7.81 (d, 1H, J = 8.43 Hz, H-3), 8.34 (d+fs, 1H, J = 5.06 Hz, J = 2.69 Hz, H-2'), 8.45 (d+fs, 1H, J = 5.39 Hz, J = 1.85 Hz, H-2).

Anal. Calcd. $C_{28}H_{20}N_2O_4$: C, 75.0; H, 4.5; N, 6.25. Found: C, 74.8; H, 4.5; N, 6.1.

(*RS*)-Methyl 5*H*-Indeno[1,2-*b*]pyridine-5-carboxylate (**5e**).

A carbanion was produced in a solution of 5*H*-indeno[1,2-*b*]-pyridine (**12**, 7.5 g, 45 mmoles) in THF (50 ml), sodium hydride (80%, 2.1 g 68 mmoles) and dimethyl sulphoxide (38 ml). Dimethyl carbonate (19 ml, 225 mmoles) was then added slowly to the stirred solution of the carbanion maintained at 20°. After another hour the mixture was poured into ice-cold 3-5M hydrochloric acid (70 ml). The *p*H of the mixture was adjusted to 6.95 with sodium hydrogen carbonate and it was then extracted with ethyl acetate (2 x 300 ml). The extracts were combined, washed with water (2 x 60 ml), dried, and the solvent was removed to leave a red oil (10 g). A portion (100 mg) of the oil was purified by preparative thin layer chromatography (stationary phase: 0.5 mm layer of silica gel HF 254^{mf}; mobile phase: chloroform). Material with Rf 0.55 was eluted from the chromatogram with chloroform; evaporation of the solvent gave chromatographically pure ester (**5e**); ir (film): ν 1735 (C=O) cm^{-1}; ms: (70 eV) m/z (%) 226 (M^++1, 6), 225 (40), 182 (40), 181 (23), 180 (10), 167 (27), 166 (100), 165 (12), 140 (17), 139 (17); ^{1}H-nmr (deuteriochloroform): δ 3.78 (s, 3H, -OCH_3), 4.90 (s, 1H, H-5), 7.19-7.30 (m, 1H, Ar), 7.48-7.56 (m, 2H, Ar), 7.73-7.77 (m, 1H, Ar), 8.00 (d, 1H, J = 7.06 Hz, Ar), 8.15 (d, 1H, J = 7.94 Hz, Ar), 8.63 (d, 1H, J = 5.43 Hz, H-2).

(*RS*)-Methyl 5*H*-5-Hydroxyindeno[1,2-*b*]pyridine-5-carboxylate (**6e**).

The enolate was prepared from (*RS*)-methyl 5*H*-indeno-[1,2-*b*]pyridine-5-carboxylate (**5e**) and oxygenated for 6 hours as described in the typical procedure for α-hydroxylation of derivatives of fluorene-9-carboxylic acid. The solvents were then removed and the residue was dissolved in 2M hydrochloric acid (2 moles). The *p*H of the solution was adjusted to 7.6 with sodium hydrogen carbonate and sodium sulphite solution was added (10% w/v, 200 ml). The product which separated (3.4 g) was collected and washed with THF (50 ml). The filtrate was extracted with ethyl acetate:diethyl ether (3:2, 2 x 225 ml), the extracts were combined, washed with water (2 x 50 ml), dried, decolorised with charcoal (2 g) and evaporated to give further product (4 g). The combined products were recrystallised from ethanol:petrol (60-80°) to give the pure hydroxy compound **6e**, yield 6.65 g (89%), mp 124-126°; ms: (70 eV) m/z (%) 241 (11), 183 (19), 182 (100), 181 (47), 154 (27), 153 (17), 152 (7), 128 (11), 127 (44), 126 (20): ir (potassium bromide): ν 1740 (C=O), 1590 (C=C), 1570 (C=N) cm-^{1}; ^{1}H-nmr (deuteriochloroform): δ 3.60 (s, 3H, -OCH_3), 4.61 (s, 1H, HO-5), 7.13-7.17 (m, 1H, Ar), 7.39-7.42 (m, 1H, Ar), 7.45-7.50 (m, 2H, Ar), 7.70 (d+fs, 1H, J = 7.68 Hz, J = 1.38 Hz, Ar), 7.93-7.95 (d+fs, 1H, J = 7.27 Hz, J = 1.01 Hz, Ar), 8.10 (d+fs, 1H, J = 4.98 Hz, J = 1.35 Hz, H-2).

Anal. Calcd. $C_{14}H_{11}NO_3$: C, 69.7; H, 4.6; N, 5.8. Found: C, 69.2; H, 4.4; N, 5.4.

(*RS*)-5*H*-5-Hydroxyindeno[1,2-*b*]pyridine-5 carboxamide (**6f**).

The methyl ester **6e**, (1.34 g, 5.56 mmoles) was dissolved in methanol (130 ml) and the solution was cooled to between 0 and 5°. A stream of dry ammonia was then passed into the cold solution for 30 minutes. The resulting turbid solution was stirred for 18 hours and then purged with nitrogen to remove the solvent. The product was slurried with a little methanol, collected by filtration and then recrystallised from ethanol to give the amide, yield 1.02 g (80%) mp 249-250°; ms: (70 eV) m/z (%) 222 (5), 182 (100), 154 (13), 127 (20); ir (potassium bromide): ν 3420 (OH), 3250 (NH_2), 1670 ($CONH_2$) cm^{-1}; ^{1}H-nmr (DMSO-d_6): δ 6.69 (s, 1H, HO-5) 7.25-7.28 (m, 1H, H-8), 7.40-7.56 (m, 4H, H-6,9, NH_2), 7.76-7.87 (m, 3H, H-3,4,7), 8.53 (d+fs, 1H, J = 5.03 Hz, J = 1.50 Hz, H-2).

Anal. Calcd. for $C_{13}H_{10}N_2O_2$: H, 4.5; N, 12.4. Found: H, 4.3; N, 12.2.

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