Formal Synthesis of Vallesamidine

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A novel route to the racemic selenide (1*RS*,12b*RS*)-1-ethyl-2,3,6,7,12,12b-hexahydro-1-[2-(phenylseleno)ethyl]indolo[2,3-*a*]quinolizin-4(1*H*)-one (**13b**), a key intermediate in the total synthesis of vallesamidine (**1**), was elaborated. Compound **3a**, obtained by *Pictet–Spengler* reaction of tryptamine and cyclohept-4-enyl-1-carbaldehyde (**2c**), was oxidized with $KMnO_4$ to the diacid **4**, which was subsequently converted into the isomeric tetracyclic lactams **5a**,**b**. After proper protection maneuvers, *Barton* decarboxylation of **10a**,**b**, trapping with $PhSe_2Ph$, and Boc removal afforded **13b**.

Introduction. – A recurring feature that appeared in many elegant syntheses designed by *R. B. Woodward* in the natural-products arena is the employment of cyclic precursors for the elaboration of chain segments or other types of ring structures. This outstanding concept [1] was set in his work on a synthesis of quinine, and sustained through those of cholesterol, strychnine, reserpine, chlorophyll, colchicine, cephalosporine C, and vitamin B_{12}, to his last contribution in erythromycin. It enables facile control of regioselectivity and stereoselectivity, a most-important factor in organic synthesis before the advent of modern methods of effective acyclic control. In our own endeavors, we have been constantly reminded of the great advantage endowed by such a strategy, and it is evident in our syntheses of phenolic sesquiterpenes [2], *ent*-herbasolide [3], 6-myoporol [4], cuparene/herbertene [5], 9-isocyanoneopupukeanane [6], tacamonine [7], nicotyrine [8], and *eburna* alkaloids [9].

Concurrent with the work on the use of a cyclopentenyl derivative to construct *eburna* alkaloids [9], we also investigated the corresponding cycloheptenyl analog, which engenders other target possibilities. The idea, represented in the *Scheme* below, is also based on symmetry consideration in synthesis design [10]. Cleavage of the alicyclic unit would lead to a tetracyclic lactam, and irrespective of the relative configurations of the two adjacent stereogenic centers, a subsequent shortening of the carboxy chain and cyclization, followed by a rearrangement process, should deliver a substance with an *aspidosperma* skeleton [11]. In this paper, we demonstrate that this intermediate is also suitable for the elaboration of vallesamidine (**1**), an unusual pentacyclic indole alkaloid from *Vallesia dichotoma* (RUIZ et PAVON) [12].

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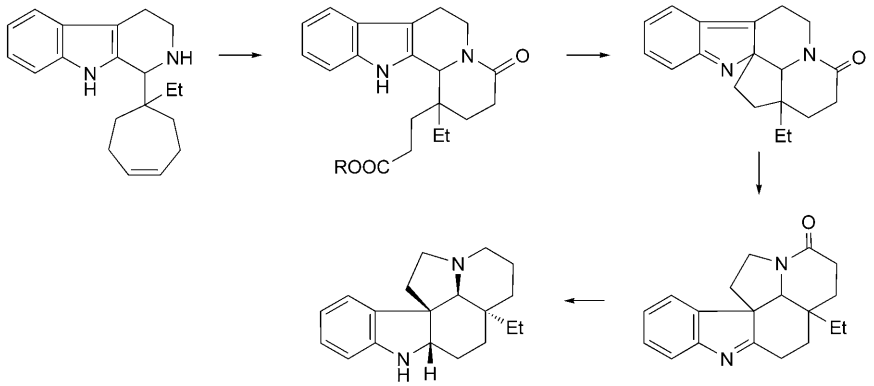
Scheme

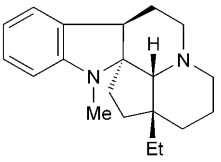


Aspidospermidine (**1**)

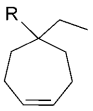
Results and Discussion. – We started our formal synthesis of vallesamidine (**1**) from cyclohept-4-ene-1-carboxylic acid, which was prepared from cyclopentanone by the method of *Stork* [13]. The carboxylic acid was then converted into the corresponding ethyl ester, which was ethylated to yield **2a** [14] in the presence of $(i\text{-}Pr)_2NLi$ (LDA). Redox manipulation of **2a** *via* the alcohol **2b** led to the aldehyde **2c**, which was used in a *Pictet–Spengler* reaction with tryptamine. The resulting tetrahydro-β-carboline **3a** was doubly Boc (= *tert*-butoxycarbonyl) protected, which gave rise to a an inseparable mixture of isomers of **3b** in a ratio of *ca.* 2 : 1 due to conformational effects of the Boc group attached to the non-indolic N-atom [15]. Next, **3b** was oxidized with $KMnO_4$ under phase-transfer conditions to the diacid **4**. The latter was esterified in refluxing EtOH in the presence of TsOH, which afforded the two diastereoisomeric pairs **5a**,**b** due to selective Boc removal at the non-indolic N-atom followed by spontaneous lactamization. The lactam esters **5a**,**b** were identified by comparison with the spectroscopic data of the corresponding methyl esters prepared according to the method of *Kuehne* [16].

Next, the separated compounds **5a** and **5b** were individually subjected to saponification which also caused Boc deprotection to afford **6a** and **6b**, and **7a** and **7b**, respectively. This removal of the Boc group was undesirable because the free NH apparently interfered with the subsequent degradation of the COOH function. A re-introduction of the *N*-Boc group could not be accomplished directly, because Boc_2O activated the carboxy group, which induced cyclization to 19-oxohomoeburnamonine. Therefore, the acids **7a**,**b** were first converted to the benzyl esters **8a**,**b**, which, after Boc protection to **9a**,**b**, were subjected to hydrogenolysis to afford the desired Boc-protected acids **10a**,**b**.

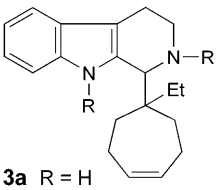
Next, compounds **10a**,**b** were subjected to *Barton* decarboxylation [17], affording, in the presence of either CCl_4 or $PhSe_2Ph$, the chloride **11a** (from **10a**) or the selenides **12a**,**b** (from a mixture of **10a**,**b**), respectively. Straightforward *trans* → *cis* conversion of **12a** into **12b** provided evidence for the stereochemical assignments of the two series of compounds. Finally, Boc removal of **12b** afforded the target compound **13b**, a known



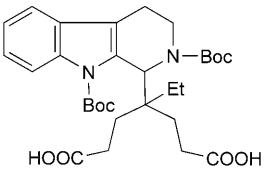
Vallesamidine (**1**)



2a R = COOEt
2b R = CH_2OH
2c R = CHO



3a R = H
3b R = Boc



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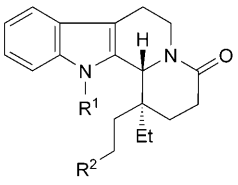

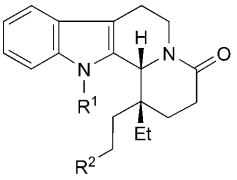

trans	R^1	R^2	*cis*
5a	Boc	COOEt	**5b**
6a	H	COOEt	**6b**
7a	H	COOH	**7b**
8a	H	COOBn	**8b**
9a	Boc	COOBn	**9b**
10a	Boc	COOH	**10b**
11a	Boc	Cl	–
12a	Boc	SePh	**12b**
13a	H	SePh	**13b**

precursor of vallesamidine (**1**) [12d]. Hence, with this protocol, a formal synthesis of **1** in its racemic form was established.

Since the cyclization of **13b** was carried out *via* homolysis of the C–Se bond, we attempted the *Barton* decarboxylation of **10b** without radical interceptor, but did not observe any pentacyclic product. We must attribute this failure to the presence of the *N*-Boc group.

In our previous work on an approach to eburnamonine, we had employed a cyclopent-3-enylcarbaldehyde to construct a tetrahydro-β-carboline intermediate, and cleavage of the C=C bond released two C_2 chains for the eventual transformation into an Et group and elements of the lactam ring. The present report describes the use of a cyclohept-4-enylcarbaldehyde, but it provided skeletal atoms for both rings *D* and *E* of vallesamidine.

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Experimental Part

General. All reactions were conducted under N_2; workup solns. were dried over Na_2SO_4. Column chromatography (CC): *Merck* silica gel (63–200 mesh). TLC: *Merck* silica gel *60-F_{254}* plates. M.p.: *Lab-*

oratory Devices; uncorrected. IR Spectra: *Bio-Rad FTS-165*; in cm^{-1}. ^1H- and ^{13}C-NMR Spectra: *Varian Unity-300*; in $CDCl_3$, unless otherwise indicated; δ in ppm, J in Hz. EI-MS: *Trio-2000* and *Jeol SX-102A*; at 70 eV, unless otherwise noted.

Ethyl 1-Ethylcyclohept-4-ene-1-carboxylate (**2a**). To a stirred soln. of LDA (16 mmol, prepared from BuLi and $(i\text{-Pr})_2NH$ in 20 ml of anh. THF) at $-78°$ was slowly added a soln. of ethyl cyclohept-4-ene-1-carboxylate (2.0 g, 11.9 mmol) in THF (5 ml), followed by a soln. of EtBr (1.63 g, 15 mmol) in THF (5 ml) after 30 min. After an additional 1 h, the mixture was warmed to r.t. and kept overnight. After quenching with sat. aq. NH_4Cl soln. (20 ml), the product was extracted with Et_2O, the combined org. solns. were washed with brine, dried (Na_2SO_4), and evaporated. The resulting residue was subjected to CC (AcOEt/hexane 1:19): **2a** (2.21 g, 95%). Colorless liquid. IR: 1725 (C=O). ^1H-NMR: 0.78 (*t*, $J=7.5$, 3 H); 1.23 (*t*, $J=7.5$, 3 H); 1.52–1.58 (*m*, 4 H); 2.08–2.14 (*m*, 6 H); 4.13 (*q*, $J=7.5$, 2 H); 5.64–5.66 (*t*, $J=2.7$, 2 H). ^{13}C-NMR: 8.98 (*q*); 14.32 (*t*); 24.43 (*t*); 32.14 (*t*); 33.81 (*t*); 50.40 (*s*); 60.08 (*t*); 131.23 (*d*); 177.20 (*s*). EI-MS (30 eV): 197 (11, $[M+1]^+$), 195 (18, $[M-1]^+$), 123 (71), 91 (100). HR-MS: 196.1477 ($C_{12}H_{20}O_2^+$; calc. 196.1464).

(1-Ethylcyclohept-4-en-1-yl)methanol (**2b**). To an ice-cooled, stirred suspension of $LiAlH_4$ (0.45 g, 11.28 mmol) in THF (15 ml) was added a soln. of **2a** (2.21 g, 11.3 mmol) in anh. THF (10 ml). After 30 min, the mixture was warmed to r.t. and left overnight. Workup involved cautious quenching with EtOH (5 ml), followed by addition of 3N aq. NaOH soln. (15 ml), extraction with Et_2O, washing with brine, drying, evaporation, and CC (AcOEt/hexane 3:17): **2b** (1.60 g, 92%). Colorless liquid. IR: 3358 (OH). ^1H-NMR: 0.81 (*t*, $J=7.5$, 3 H); 1.35–1.48 (*m*, 6 H); 2.08–2.10 (*m*, 4 H); 3.40 (*s*, 2 H); 5.62 (*t*, $J=2.7$, 2 H). ^{13}C-NMR: 7.81 (*q*); 23.71 (*t*); 27.12 (*t*); 32.98 (*t*); 40.06 (*s*); 67.16 (*t*); 130.99 (*d*). EI-MS: 154 (3, M^+), 137 (3), 123 (43), 107 (58). HR-MS: 154.1358 ($C_{10}H_{18}O^+$; calc. 154.1358).

1-Ethylcyclohept-4-ene-1-carbaldehyde (**2c**). Pyridinium chlorochromate (PCC; 5.09 g, 23.6 mmol) was added in portions to a mixture of **2b** (1.55 g, 10.1 mmol), Na_2CO_3 (4.30 g, 40.6 mmol), and powdered 4-Å molecular sieves (5.60 g) in anh. CH_2Cl_2 (40 ml) at r.t. After 1 h, the mixture was diluted with Et_2O (25 ml), and passed through a pad of *Florisil*. The filtrate was evaporated, and the residue was subjected to CC (AcOEt/hexane 1:19): **2c** (1.20 g, 78%). Colorless liquid. IR: 1722 (C=O). ^1H-NMR: 0.77 (*t*, $J=7.5$, 3 H); 1.49–1.58 (*m*, 4 H); 1.88–1.96 (*m*, 2 H); 2.06–2.10 (*m*, 4 H); 5.62 (*t*, $J=3.0$, 2 H); 9.41 (*s*, 1 H). ^{13}C-NMR: 8.41 (*q*); 23.69 (*t*); 28.04 (*t*); 30.47 (*t*); 52.78 (*s*); 130.87 (*d*); 206.60 (*d*). EI-MS (30 eV): 153 (4, $[M+1]^+$), 151 (4, $[M-1]^+$), 123 (28), 109 (65), 81 (99), 67 (100). HR-MS: 153.1294 ($[M+1]^+$, $C_{10}H_{17}O^+$; calc. 153.1280).

*1-(1-Ethylcyclohept-4-en-1-yl)-2,3,4,9-tetrahydro-1*H*-pyrido[3,4-*b*]indole* (**3a**). A soln. of **2c** (0.15 g, 1.0 mmol) in anh. CH_2Cl_2 (3 ml) was mixed with a soln. of tryptamine (0.18 g, 1.1 mmol) in CH_2Cl_2 (3 ml), and this mixture was stirred at r.t. overnight. On cooling to 0°, the mixture was treated with a soln. of CF_3COOH (TFA; 5.0 mmol, 0.4 ml) in CH_2Cl_2 (2 ml) over 10 min. After 1 h, the ice bath was removed, the mixture was kept overnight, and poured into ice-cold 5% aq. $NaHCO_3$ soln. (50 ml). Workup involved layer separation, extraction with CH_2Cl_2, washing with aq. $NaHCO_3$ soln. and brine, drying, evaporation, and CC (AcOEt/hexane 1:5 → 9:5): **3a** (0.12 g, 61%). Thick oil. IR: 3482 (NH). ^1H-NMR: 0.71 (*t*, $J=7.5$, 3 H); 1.37–1.64 (*m*, 2 H); 1.66–1.93 (*m*, 4 H); 2.12–2.33 (*m*, 4 H); 2.70–2.74 (*m*, 2 H); 2.81–2.89 (*m*, 1 H); 3.35 (*dt*, $J=11.7$, 3.6, 1 H); 4.21 (*s*, 1 H); 5.68 (*s*, 1 H); 7.08–7.19 (*m*, 2 H); 7.34 (*d*, $J=7.5$, 1 H); 7.51 (*d*, $J=7.5$, 1 H); 7.89 (*s*, 1 H). ^{13}C- NMR: 8.03 (*q*); 23.18 (*t*); 24.65 (*t*); 24.70 (*t*); 27.51 (*t*); 33.42 (*t*); 35.57 (*t*); 43.20 (*s*); 43.78 (*t*); 58.58 (*d*); 110.48 (*d*); 112.04 (*s*); 117.69 (*d*); 119.13 (*d*); 121.34 (*d*); 127.11 (*s*); 130.34 (*d*); 130.64 (*s*); 134.56 (*s*); 135.44 (*s*). EI-MS: 294 (5, M^+), 186 (10), 171 (100). HR-MS: 294.2116 (M^+, $C_{20}H_{26}N_2^+$; calc. 294.2098).

*Di(*tert*-Butyl) 1-(1-Ethylcyclohept-4-en-1-yl)-3,4-dihydro-1*H*-pyrido[3,4-*b*]indole-2,9-dicarboxylate* (**3b**). Compound **3a** (0.10 g, 0.34 mmol) was mixed with $(Boc)_2O$ (0.25 g, 1.18 mmol) and DMAP[2]) (0.01 g, 0.02 mmol) in CH_2Cl_2 (5 ml), and stirred at 50° overnight. Workup involved dilution with CH_2Cl_2 (5 ml), washing with brine, drying, evaporation, and CC (AcOEt/hexane 1:1): **3b** (0.11 g, 60%; two isomers). Thick oil. IR: 1734, 1691 (C=O). ^1H-NMR (isomer mixture): 0.81–0.89 (*m*, 3 H); 1.41–1.80 (*m*, 24 H); 1.83–2.34 (*m*, 4 H); 2.74 (major), 2.69 (minor) (*d*, $J=5.4$, 1 H); 2.88–3.00 (*m*, 1

[2]) 4-(Dimethylamino)pyridine.

H); 3.38–3.60 (*m*, 1 H); 4.27–4.35 (minor), 4.58 (major) (*dd*, *J* = 13.5, 8.4, 1 H); 5.61 (br. *s*, 2 H); 6.26 (major), 6.32 (minor) (*s*, 1 H); 7.17–7.27 (*m*, 2 H); 7.39 (*d*, *J* = 7.5, 1 H); 7.88 (major), 7.94 (minor) (*d*, *J* = 7.5, 1 H). ^{13}C-NMR (major isomer): 8.31 (*q*); 19.69 (*t*); 24.14 (*t*); 27.81 (*q*); 28.16 (*t*); 32.41 (*t*); 35.07 (*t*); 37.11 (*t*); 45.95 (*s*); 54.03 (*d*); 80.17 (*s*); 83.60 (*s*); 114.97 (*d*); 116.93 (*s*); 117.91 (*d*); 122.44 (*d*); 123.86 (*d*); 129.04 (*s*); 130.86 (*d*); 131.27 (*d*); 135.12 (*s*); 136.69 (*s*); 151.13 (*s*); 155.70 (*s*). EI-MS: 494 (1, M^+), 371 (35), 315 (29), 294 (13), 259 (78), 215 (81), 171(42), 57 (100). HR-MS: 494.3118 (M^+, $C_{30}H_{42}N_2O_4^+$; calc. 494.3147).

tert-*Butyl (1*RS*,12b*SR*)-* (**5a**) *and* tert-*Butyl (1*RS*,12b*RS*)-1-(3-Ethoxy-3-oxopropyl)-1-ethyl-1,3,4,6,7,12b-hexahydro-4-oxoindolo[2,3-*a*]quinolizine-12(2*H*)-carboxylate* (**5b**). To an ice-cooled, stirred mixture of **3b** (200 mg, 0.40 mmol), Bu_4NBr (20 mg, 0.06 mmol) in THF (2.0 ml), and H_2O (12.0 ml) was added $KMnO_4$ (320 mg, 2.0 mmol) in several lots over 30 min. Another portion of H_2O (3.0 ml) was added, and the mixture was warmed to r.t. Excess oxidant was destroyed with Na_2SO_3 (250 mg, 2.0 mmol), the mixture was diluted with CH_2Cl_2 (15 ml), filtered through a pad of *Celite*, and evaporated. The solid residue was taken up in CH_2Cl_2 (15 ml), and the soln. was washed with brine, dried, and evaporated to afford the diacid **4**, which was immediately refluxed with TsOH (10 mg, 0.05 mmol) in $CHCl_3$ (7.5 ml) and EtOH (5.0 ml) for 18 h. Workup involved dilution with CH_2Cl_2 (15 ml), layer separation, washing with brine, drying, evaporation and CC (AcOEt/hexane gradient: 1:5 → 9:5) to afford the *trans*- and *cis*-isomers **5a** (40 mg, 21%) and **5b** (30 mg, 16%), resp.

Data of **5a**. Pale-yellow, amorphous solid. IR: 1732, 1665 (C=O). ^{1}H-NMR: 0.50 (*t*, *J* = 7.5, 3 H); 0.89–1.04 (*m*, 1 H); 1.06–1.18 (*m*, 1 H); 1.23 (*t*, *J* = 7.2, 3 H); 1.47–1.57 (*m*, 1 H); 1.63 (*s*, 9 H); 1.69–1.84 (*m*, 2 H); 1.94–2.04 (*m*, 1 H); 2.21 (*ddd*, *J* = 4.5, 12, 14, 1 H); 2.42–2.50 (*m*, 2 H); 2.54–2.71 (*m*, 2 H); 2.80–2.90 (*m*, 2 H); 4.03–4.14 (*m*, 2 H); 4.80–4.85 (*m*, 1 H); 5.57 (*s*, 1 H); 7.21–7.32 (*m*, 2 H); 7.44 (*d*, *J* = 1.5, 7.8, 1 H); 7.94 (*d*, *J* = 7.8, 1 H). ^{13}C-NMR: 7.65 (*q*); 14.13 (*q*); 20.97 (*t*); 26.61 (*t*); 28.11 (*q*); 29.30 (*t*); 29.68 (*t*); 30.31 (*t*); 30.75 (*t*); 39.03 (*t*); 42.93 (*s*); 58.41 (*d*); 60.22 (*t*); 84.63 (*s*); 115.85 (*d*); 118.15 (*d*); 122.80 (*s*); 123.02 (*d*); 124.69 (*d*); 128.20 (*s*); 132.81 (*s*); 137.23 (*s*); 151.20 (*s*); 172.93 (*s*); 173.56 (*s*). EI-MS: 468 (66, M^+), 368 (62), 339 (19), 323 (25), 256 (63), 214 (88), 169 (100). HR-MS: 468.2620 ($C_{27}H_{36}N_2O_5^+$; calc. 468.2626).

Data of **5b**. Colorless, thick oil. IR: 1732, 1665 (C=O). ^{1}H-NMR: 0.93 (*t*, *J* = 7.5, 3 H); 1.07 (*t*, *J* = 7.2, 3 H); 1.31–1.43 (*m*, 2 H); 1.45–1.64 (*m*, 4 H); 1.66 (*s*, 9 H); 1.72–1.95 (*m*, 2 H); 2.46–2.53 (*m*, 2 H); 2.70–2.88 (*m*, 3 H); 3.91 (*q*, *J* = 7.2, 2 H); 4.82–4.87 (*m*, 1 H); 5.54 (*s*, 1 H); 7.20–7.32 (*m*, 2 H); 7.45 (*d*, *J* = 1.5, 7.8, 1 H); 7.92 (*d*, *J* = 7.8, 1 H). ^{13}C-NMR: 8.63 (*q*); 13.97 (*q*); 20.89 (*t*); 27.56 (*t*); 28.14 (*q*); 28.82 (*t*); 28.92 (*t*); 30.16 (*t*); 31.04 (*t*); 39.16 (*t*); 43.14 (*s*); 58.33 (*d*); 60.18 (*t*); 84.49 (*s*); 115.28 (*d*); 118.37 (*d*); 122.69 (*s*); 122.99 (*d*); 124.77 (*d*); 127.95 (*s*); 132.34 (*s*); 136.95 (*s*); 151.09 (*s*); 173.05 (*s*); 173.36 (*s*). EI-MS: 468 (40, M^+), 368 (41), 339 (10), 323 (15), 256 (28), 214 (61), 169 (100). HR-MS: 468.2608 ($C_{27}H_{36}N_2O_5^+$; calc. 468.2626).

*Ethyl 3-[(1*RS*,12b*SR*)-* (**6a**) *and Ethyl 3-[(1*RS*,12b*RS*)-1-Ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoate* (**6b**). A soln. of **5a** (60 mg, 0.13 mmol) in CH_2Cl_2 (5 ml) was mixed with CF_3COOH (1.0 ml), and refluxed overnight. The mixture was diluted with CH_2Cl_2 (15 ml) and poured into ice-cold 5% aq. $NaHCO_3$ soln. (15 ml). Workup involved layer separation, extraction with CH_2Cl_2, washing with aq. $NaHCO_3$ soln. and brine, drying, evaporation, and CC (AcOEt/hexane 1:5 → 9.5): **6a** (20 mg, 42%) and **6b** (15 mg, 31%).

Data of **6a**. Colorless solid. M.p. 199–201°. IR: 3317 (NH), 1730, 1621 (C=O). ^{1}H-NMR: 0.69 (*t*, *J* = 7.5, 3 H); 0.80–1.09 (*m*, 2 H); 1.31 (*t*, *J* = 7.2, 3 H); 1.38–1.48 (*m*, 1 H); 1.54–1.62 (*m*, 1 H); 1.68–1.78 (*m*, 1 H); 1.98–2.08 (*m*, 1 H); 2.21–2.29 (*m*, 1 H); 2.38–2.47 (*m*, 2 H); 2.52–2.58 (*m*, 2 H); 2.64–2.75 (*m*, 2 H); 4.22 (*q*, *J* = 7.2, 2 H); 4.72 (*s*, 1 H); 5.05–5.10 (*m*, 1 H); 7.05–7.18 (*m*, 2 H); 7.39 (*d*, *J* = 7.8, 1 H); 7.47 (*d*, *J* = 7.8, 1 H); 9.35 (br. *s*, 1 H). ^{13}C-NMR: 6.92 (*q*); 14.07(*q*); 20.99 (*t*); 23.91 (*t*); 26.66 (*t*); 28.10 (*t*); 28.78 (*t*); 30.80 (*t*); 39.09 (*s*); 40.80 (*t*); 60.08 (*d*); 61.33 (*t*); 111.12 (*d*); 112.94 (*s*); 117.84 (*d*); 119.36 (*d*); 121.86 (*d*); 126.17 (*s*); 130.35 (*s*); 136.39 (*s*); 169.92 (*s*); 175.00 (*s*). EI-MS: 368 (66, M^+), 339 (11), 323 (11), 251 (21), 211 (66), 169 (100). HR-MS: 368.2101 ($C_{22}H_{28}N_2O_3^+$; calc. 368.2101).

Data of **6b**. Colorless oil. IR: 3317 (NH), 1731, 1622 (C=O). ^{1}H-NMR: 1.12–1.18 (*m*, 6 H); 1.39–1.46 (*m*, 1 H); 1.49–1.57 (*m*, 1 H); 1.67–1.89 (*m*, 2 H); 1.90–1.96 (*m*, 2 H); 2.04–2.13 (*m*, 2 H); 2.45–2.56 (*m*, 2 H); 2.67–2.78 (*m*, 3 H); 4.01 (*q*, *J* = 7.2, 2 H); 4.80 (*s*, 1 H); 5.10–5.14 (*m*, 1 H); 7.08–7.19 (*m*, 2 H); 7.34

(*d*, *J* = 7.8, 1 H); 7.49 (*d*, *J* = 7.8, 1 H); 8.16 (br. *s*, 1 H). ^{13}C-NMR: 8.07 (*q*); 14.06 (*q*); 20.99 (*t*); 27.24 (*t*); 27.30 (*t*); 28.46 (*t*); 28.85 (*t*); 29.73 (*t*); 39.03 (*s*); 41.11 (*t*); 60.46 (*d*); 60.58 (*t*); 110.97 (*d*); 113.40 (*s*); 118.22 (*d*); 119.79 (*d*); 122.30 (*d*); 126.42 (*s*); 130.40 (*d*); 136.26 (*s*); 169.90 (*s*); 173.37 (*s*). EI-MS: 368 (91, M^+), 323 (14), 211 (56), 170 (79), 169 (100). HR-MS: 368.2102 (M^+, $C_{22}H_{28}N_2O_3^+$; calc. 368.2101).

*3-[(1*RS*,12b*SR*)-1-Ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoic Acid* (**7a**). To a soln. of **6a** (30 mg, 0.064 mmol) in EtOH (5.0 ml) was added 50% aq. KOH soln. (0.80 g), and the resulting soln. was stirred at r.t. overnight. H_2O (10 ml) was added, and the soln. was carefully acidified with conc. HCl, extracted with CH_2Cl_2 (25 ml), washed with brine, dried, and evaporated: **7a** (15 mg, 69%). Pale-yellow solid. M.p. 220–224°. IR: 3296 (NH, OH); 1721, 1672 (C=O). ^{1}H-NMR: 0.58 (*t*, *J* = 7.5, 3 H); 0.82–1.00 (*m*, 1 H); 1.20–1.30 (*m*, 1H); 1.47–1.80 (*m*, 2 H); 1.90–2.14 (*m*, 2 H); 2.24–2.47 (*m*, 4 H); 2.58–2.67 (*m*, 2 H); 4.66 (*s*, 1 H); 4.95 (*d*, *J* = 6.6, 1 H); 6.98 (*d*, *J* = 7.5, 1 H); 7.05 (*d*, *J* = 7.5, 1 H); 7.30 (*d*, *J* = 7.5, 1 H); 7.38 (*d*, *J* = 7.5, 1 H); 9.62 (br. *s*, 1 H). ^{13}C-NMR: 6.81 (*q*); 20.78 (*t*); 23.84 (*t*); 26.42 (*t*); 27.96 (*t*); 28.44 (*t*); 30.75 (*t*); 38.84 (*s*); 41.03 (*t*); 60.60 (*d*); 111.07 (*d*); 112.36 (*s*); 117.60 (*d*); 119.09 (*d*); 121.66 (*d*); 125.92 (*s*); 130.09 (*s*); 136.45 (*s*); 171.02 (*s*); 176.97(*s*). EI-MS: 340 (43, M^+), 322 (14), 293 (11), 211 (46), 169 (100). HR-MS: 340.1767 ($C_{20}H_{24}N_2O_3^+$; calc. 340.1788).

*3-[(1*RS*,12b*RS*)-1-Ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoic Acid* (**7b**). To a soln. of **6b** (20 mg, 0.043 mmol) in EtOH (5.0 ml) was added 50% aq. KOH soln. (800 mg), and the mixture was stirred at r.t. overnight. H_2O (10 ml) was added, and the soln. was carefully acidified with conc. HCl, extracted with CH_2Cl_2 (25 ml), washed with brine, dried, and evaporated: **7b** (10 mg, 67%). Pale-yellow solid. M.p. 235–238°. IR: 3259 (NH, OH), 1728, 1672 (C=O). ^{1}H-NMR: 1.10 (*m*, 3 H); 1.24–1.49 (*m*, 2 H); 1.66–1.89 (*m*, 4 H); 1.97–2.11 (*m*, 2 H); 2.38–2.56 (*m*, 2 H); 2.60–2.72 (*m*, 3 H); 4.75 (*s*, 1 H); 5.04–5.06 (*m*, 1 H); 7.05–7.18 (*m*, 2 H); 7.33 (*d*, *J* = 7.8, 1 H); 7.43 (*d*, *J* = 7.8, 1 H); 8.20 (br. *s*, 1 H). ^{13}C-NMR: 8.00 (*q*); 20.87 (*t*); 26.75 (*t*); 26.99 (*t*); 28.08 (*t*); 28.49 (*t*); 29.59 (*t*); 38.80 (*s*); 41.38 (*t*); 60.54 (*d*); 111.12 (*d*); 112.94 (*s*); 118.07 (*d*); 119.65 (*d*); 122.19 (*d*); 126.24 (*s*); 130.11 (*d*); 136.33 (*s*); 170.89 (*s*); 176.71(*s*). EI-MS: 340 (43, M^+), 211 (46), 169 (100). HR-MS: 340.1787 (M^+, $C_{20}H_{24}N_2O_3^+$; calc. 340.1788).

*Phenylmethyl 3-[(1*RS*,12b*SR*)-* (**8a**) *and Phenylmethyl 3-[(1*RS*,12b*RS*)-1-Ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoate* (**8b**). To a mixture of the acids **7a**,**b** (210 mg, 0.62 mmol) and BnOH (1.35 g, 12.5 mmol) in THF (12.5 ml) was added Me_3SiCl (0.75 ml, 6 mmol) over 3 min at r.t. The resulting soln. was refluxed for 18 h, cooled, diluted with CH_2Cl_2 (30 ml), and poured into ice-cold 5% aq. $NaHCO_3$ soln. (15 ml). Workup involved layer separation, extraction with CH_2Cl_2, washing with aq. $NaHCO_3$ soln. and brine, drying, concentration *in vacuo*, and CC (AcOEt/hexane 1:7 → 9:3): **8a** (120 mg, 45%) and **8b** (90 mg, 34%).

Data of **8a**. Oil. IR: 3318 (NH), 1734, 1621 (C=O). ^{1}H-NMR: 0.69 (*t*, *J* = 7.5, 3 H); 0.82–1.02 (*m*, 2 H); 1.39–1.49 (*m*, 1 H); 1.55–1.63 (*m*, 1 H); 1.69–1.80 (*m*, 1 H); 2.03–2.11 (*m*, 1 H); 2.21–2.31 (*m*, 1 H); 2.40–2.49 (*m*, 2 H); 2.59–2.67 (*m*, 2 H); 2.69–2.75 (*m*, 2 H); 4.68 (*s*, 1 H); 5.05–5.10 (*m*, 1 H); 5.20 (*dd*, *J* = 15, 12, 2 H); 7.09 (*dt*, *J* = 1.2, 7.2, 1 H); 7.16 (*dt*, *J* = 1.2, 7.2, 1 H); 7.29–7.37 (*m*, 6 H); 7.48 (*d*, *J* = 7.2, 1 H); 9.15 (br. *s*, 1 H). ^{13}C-NMR: 7.01 (*q*); 21.06 (*t*); 24.05 (*t*); 26.82 (*t*); 28.34 (*t*); 28.92 (*t*); 31.01 (*t*); 39.23 (*s*); 40.84 (*t*); 60.15 (*d*); 67.30 (*t*); 111.20 (*d*); 113.15 (*s*); 117.94 (*d*); 119.49 (*d*); 121.98 (*d*); 126.27 (*s*); 128.46 (*d*); 128.58 (*d*); 128.68 (*d*); 130.37 (*s*); 135.16 (*s*); 136.44 (*s*); 169.93 (*s*); 174.88 (*s*). EI-MS: 430 (26, M^+), 339 (24), 251 (11), 211 (48), 170 (100), 169 (97). HR-MS: 430.2260 (M^+, $C_{27}H_{30}N_2O_3^+$; calc. 430.2258).

Data of **8b**. Amorphous solid. IR: 3318 (NH), 1734, 1621 (C=O). ^{1}H-NMR: 1.12 (*t*, *J* = 7.5, 3 H); 1.39–1.46 (*m*, 1 H); 1.49–1.56 (*m*, 1 H); 1.67–1.94 (*m*, 4 H); 2.08–2.19 (*m*, 2 H); 2.43–2.54 (*m*, 2 H); 2.67–2.80 (*m*, 3 H); 4.79 (*s*, 1 H); 4.99 (*s*, 2 H); 5.08–5.13 (*m*, 1 H); 7.09–7.37 (*m*, 7 H); 7.36 (*d*, *J* = 7.5, 1 H); 7.49 (*d*, *J* = 7.5, 1 H); 8.22 (br. *s*, 1 H). ^{13}C-NMR: 8.06 (*q*); 20.95 (*t*); 27.17 (*t*); 27.26 (*t*); 28.36 (*t*); 28.82 (*t*); 29.70 (*t*); 38.96 (*s*); 41.01 (*t*); 60.28 (*d*); 66.33 (*t*); 110.97 (*d*); 113.30 (*s*); 118.18 (*d*); 119.74 (*d*); 122.25 (*d*); 126.34 (*s*); 128.12 (*d*); 128.17 (*d*); 128.46 (*d*); 130.29 (*s*); 135.59 (*s*); 136.22 (*s*); 169.86 (*s*); 173.06 (*s*). EI-MS: 430 (68, M^+), 339 (39), 251 (15), 211 (70), 170 (100), 169 (80). HR-MS: 430.2261 (M^+, $C_{27}H_{30}N_2O_3^+$; calc. 430.2258).

tert-*Butyl (1*RS*,12b*SR*)-1-Ethyl-1,3,4,6,7,12b-hexahydro-4-oxo-1-[3-oxo-3-(phenylmethoxy)propyl]-indolo[2,3-*a*]quinolizine-12(2*H*)-carboxylate* (**9a**). Compound **8a** (150 mg, 0.35 mmol) was mixed with $(Boc)_2O$ (150 mg, 0.71 mmol) and DMAP[2]) (20 mg, 0.2 mmol) in CH_2Cl_2 (5 ml), and stirred at 50° over-

night. Workup involved dilution with CH_2Cl_2 (5 ml), washing with brine, drying, concentration, and CC (AcOEt/hexane 1:1): **9a** (150 mg, 80%). Colorless oil. IR: 1732, 1660, 1646 (C=O). ^{1}H-NMR: 0.50 (*t*, *J* = 7.5, 3 H); 0.92–1.00 (*m*, 1 H); 1.06–1.16 (*m*, 1 H); 1.47–1.5 (*m*, 1 H); 1.60 (*s*, 9 H); 1.69–1.84 (*m*, 2 H); 1.97–2.06 (*m*, 1 H); 2.28 (*ddd*, *J* = 4.5, 12, 14, 1 H); 2.43–2.49 (*m*, 2 H); 2.56–2.71 (*m*, 2 H); 2.80–2.90 (*m*, 2 H); 4.81–4.86 (*m*, 1 H); 5.05 (*d*, *J* = 12, 1 H); 5.12 (*d*, *J* = 12, 1 H); 5.58 (*s*, 1 H); 7.22–7.35 (*m*, 7 H); 7.45 (*d*, *J* = 7.5, 1 H); 7.95 (*d*, *J* = 7.5, 1 H). ^{13}C-NMR: 7.67 (*q*); 20.99 (*t*); 26.58 (*t*); 28.10 (*q*); 29.31 (*t*); 29.65 (*t*); 30.27 (*t*); 30.71 (*t*); 39.09 (*t*); 42.93 (*s*); 58.45 (*d*); 66.16 (*t*); 84.70 (*s*); 115.91 (*d*); 118.19 (*d*); 122.85 (*s*); 123.07 (*d*); 124.73 (*d*); 128.13 (*d*) 128.17 (*d*) 128.23 (*s*); 128.49 (*d*); 132.80 (*s*); 135.82 (*s*); 137.23 (*s*); 151.25 (*s*); 172.95 (*s*); 173.40 (*s*). EI-MS: 530 (9, M^+), 430 (22), 339 (19), 251 (36), 211 (86), 169 (100). HR-MS: 530.2776 ($C_{32}H_{38}N_2O_5^+$; calc. 530.2782).

tert-*Butyl (1*RS*,12b*RS*)-1-Ethyl-1,3,4,6,7,12b-hexahydro-4-oxo-1-[3-oxo-3-(phenylmethoxy)propyl]-indolo[2,3-*a*]quinolizine-12(2*H*)-carboxylate* (**9b**). Compound **8b** (100 mg, 0.23 mmol) was mixed with $(Boc)_2O$ (100 mg, 0.46 mmol) and DMAP[2]) (10 mg, 0.1 mmol) in CH_2Cl_2 (5 ml), and stirred at 50° overnight. Workup involved dilution with CH_2Cl_2 (5 ml), washing with brine, drying, evaporation, and CC (AcOEt/hexane 1:1): **9b** (100 mg, 82%). Colorless oil. IR: 1733, 1664 (C=O). ^{1}H-NMR: 0.92 (*t*, *J* = 7.5, 3 H); 1.32–1.42 (*m*, 2 H); 1.46–1.66 (*m*, 4 H); 1.65 (*s*, 9 H); 1.75–2.03 (*m*, 2 H); 2.40–2.52 (*m*, 2 H); 2.69–2.85 (*m*, 3 H); 4.80–4.85 (*m*, 1 H); 4.85–4.91 (*m*, 2 H); 5.53 (*s*, 1 H); 7.11–7.14 (*m*, 1 H); 7.20–7.32 (*m*, 5 H); 7.39 (*d*, *J* = 7.5, 1 H); 7.92 (*d*, *J* = 7.5, 1 H). ^{13}C-NMR: 8.64 (*q*); 20.86 (*t*); 27.55 (*t*); 28.13 (*q*); 28.81 (*t*); 29.05 (*t*); 30.22 (*t*); 31.04 (*t*); 39.10 (*t*); 43.10 (*s*); 58.21 (*d*); 66.03 (*t*); 84.48 (*s*); 115.29 (*d*); 118.39 (*d*); 122.69 (*s*); 123.00 (*d*); 124.77 (*d*); 127.96 (*d*); 128.06 (*d*); 128.14 (*s*); 128.40 (*d*); 132.33 (*s*); 135.70 (*s*); 136.93 (*s*); 151.07 (*s*); 173.02 (*s*); 173.11 (*s*). EI-MS: 530 (9, M^+), 430 (22), 339 (19), 251 (36), 211 (86), 169 (100). HR-MS: 530.2808 ($C_{32}H_{38}N_2O_5^+$; calc. 530.2782).

*3-[(1*RS*,12b*SR*)-12-(*tert-*Butoxycarbonyl)-1-ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoic Acid* (**10a**). MeOH (2.0 ml) was carefully added to 5% Pd·C (10 mg), followed by $NaHCO_3$ (100 mg) and a soln. of **9a** (180 mg, 0.34 mmol) in MeOH (8.0 ml). The mixture was stirred under H_2 at r.t. for 2 d. Workup involved dilution with CH_2Cl_2 (15 ml) and sat. NH_4Cl (10 ml), followed by filtration, washing with brine, drying, and evaporation: **10a** (125 mg, 85%). Pale-yellow solid. M.p. 188–190° (dec.). IR: 3435 (OH), 1731, 1620 (C=O). ^{1}H-NMR: 0.50 (*t*, *J* = 7.2, 3 H); 0.92–1.17 (*m*, 2 H); 1.46–1.57 (*m*, 1 H); 1.64 (*s*, 9 H); 1.73–1.84 (*m*, 2 H); 1.95–2.04 (*m*, 1 H); 2.21–2.32 (*m*, 1 H); 2.48–2.51 (*m*, 2 H); 2.57–2.72 (*m*, 2 H); 2.81–2.90 (*m*, 2 H); 4.82–4.86 (*m*, 1 H); 5.60 (*s*, 1 H); 7.23–7.32 (*m*, 2 H); 7.50 (*dd*, *J* = 1.5, 7.8, 1 H); 7.95 (*d*, *J* = 7.8, 1 H). ^{13}C-NMR: 7.77 (*q*); 20.99 (*t*); 26.45 (*t*); 28.19 (*q*); 29.10 (*t*); 29.55 (*t*); 30.07 (*t*); 30.71 (*t*); 39.33 (*t*); 42.95 (*s*); 58.76 (*d*); 84.86 (*s*); 115.99 (*d*); 118.28 (*d*); 122.87 (*s*); 123.14 (*d*); 124.83 (*d*); 128.24 (*s*); 132.70 (*s*); 137.26 (*s*); 151.31 (*s*); 173.36 (*s*); 178.06 (*s*). EI-MS: 440 (0.4, M^+), 211 (29), 169 (100). HR-MS: 440.2295 (M^+, $C_{25}H_{32}N_2O_5^+$; calc. 440.2313).

*3-[(1*RS*,12b*RS*)-12-(*tert-*Butoxycarbonyl)-1-ethyl-1,2,3,4,6,7,12,12b-octahydro-4-oxoindolo[2,3-*a*]quinolizin-1-yl]propanoic Acid* (**10b**). MeOH (2.0 ml) was carefully added to 5% Pd·C (10 mg), followed by $NaHCO_3$ (100 mg) and a soln. of **9b** (150 mg, 0.28 mmol) in MeOH (8.0 ml). The mixture was stirred under H_2 at r.t. for 2 d. Workup as above afforded **10b** (100 mg, 82%). Colorless solid. M.p. 188–190° (dec.). IR: 3445 (OH), 3053, 2970, 2932, 2884 (CH), 1732, 1645, 1624 (C=O). ^{1}H-NMR: 0.93 (*t*, *J* = 6.6, 3 H); 1.38–1.44 (*m*, 2 H); 1.48–1.63 (*m*, 4 H); 1.66 (*s*, 9 H); 1.72–1.95 (*m*, 2 H); 2.32–2.56 (*m*, 2 H); 2.75–2.88 (*m*, 3 H); 4.85 (br. *d*, *J* = 9.6, 1 H); 5.54 (*s*, 1 H); 7.23–7.32 (*m*, 2 H); 7.44 (*d*, *J* = 7.5, 1 H); 7.92 (*d*, *J* = 7.5, 1 H). ^{13}C-NMR: 8.59 (*q*); 20.94 (*t*); 27.60 (*t*); 28.22 (*q*); 28.45 (*t*); 28.59 (*t*); 30.01 (*t*); 30.99 (*t*); 39.39 (*t*); 43.18 (*s*); 58.57 (*d*); 84.60 (*s*); 115.35 (*d*); 118.52 (*s*); 122.74 (*d*); 123.12 (*d*); 124.90 (*d*); 127.99 (*s*); 132.31 (*s*); 137.06 (*s*); 151.17 (*s*); 173.26 (*s*); 177.41 (*s*). EI-MS: 440 (10, M^+), 211 (36), 169 (100). HR-MS: 440.2295 (M^+, $C_{25}H_{32}N_2O_5^+$; calc. 440.2313).

tert-*Butyl (1*RS*,12b*SR*)-1-(2-Chloroethyl)-1-ethyl-1,3,4,6,7,12b-hexahydro-4-oxoindolo[2,3-*a*]quinolizine-12(2*H*)-carboxylate* (**11a**). To a stirred, ice-cooled mixture of **10a** (50 mg, 0.113 mmol) in THF (3.0 ml) and *N*-methylmorpholine (40 mg, 0.40 mmol) in THF (1 ml) was added ethyl chloroformate (40 mg, 0.37 mmol) in THF (1 ml). After 30 min, solns. of Et_3N (40 mg, 0.40 mmol) in CCl_4 (2 ml) and *N*-hydroxy-2-thiopyridone (40 mg, 0.31 mmol) in CCl_4 (3 ml) were added consecutively. After another 30 min, the yellow-colored mixture was cooled in an ice bath, and irradiated at 300 nm with a *Rayonet* photochemical apparatus for 1 h. Workup involved dilution with CH_2Cl_2 (10 ml), washing with 5% aq.

HCl, brine, drying, evaporation, and CC (AcOEt/hexane 1:5 → 9:5): **11a** (20 mg, 41%). Colorless oil. IR: 1730, 1665 (C=O). ^{1}H-NMR: 0.53 (*t*, *J* = 7.5, 3 H); 0.86–1.01 (*m*, 1 H); 1.03–1.22 (*m*, 1 H); 1.53–1.64 (*m*, 1 H); 1.70 (*s*, 9 H); 1.82–1.91 (*m*, 1 H); 2.01 (*td*, *J* = 14.0, 5.0, 1 H); 2.13 (*td*, *J* = 14.0, 5.0, 1 H); 2.47 (*t*, *J* = 6.9, 2 H); 2.59–2.70 (*m*, 1 H); 2.80–2.89 (*m*, 2 H); 3.42 (*td*, *J* = 10.8, 5.0, 1 H); 3.76 (*td*, *J* = 10.8, 5.0, 1 H); 4.84 (*dd*, *J* = 11.7, 4.5, 1 H); 5.61 (*s*, 1 H); 7.24–7.33 (*m*, 2 H); 7.45 (*dd*, *J* = 8.0, 1.2, 1 H); 7.97 (*d*, *J* = 8.0, 1 H). ^{13}C-NMR: 7.89 (*q*); 21.05 (*t*); 26.26 (*t*); 28.40 (*q*); 30.13 (*t*); 30.75 (*t*); 39.09 (*t*); 39.15 (*t*); 41.02 (*t*); 43.93 (*s*); 58.62 (*d*); 85.13 (*s*); 116.01 (*d*); 118.31 (*d*); 123.06 (*s*); 123.21 (*d*); 124.91 (*d*); 128.27 (*s*); 132.59 (*s*); 137.22 (*s*); 151.38 (*s*); 172.66 (*s*). EI-MS: 430 (24, M^+), 374 (24), 255 (33), 211 (20), 169 (100). HR-MS: 430.2023 ($C_{24}H_{31}ClN_2O_3^+$; calc. 430.2025).

tert-*Butyl (1*RS,*12b*SR)- (**12a**) *and* tert-*Butyl (1*RS,*12b*RS)*-1-Ethyl-1,3,4,6,7,12b-hexahydro-4-oxo-1-[2-(phenylseleno)ethyl]indolo[2,3*-a]*quinolizine-12(2*H*)-carboxylate* (**12b**). To a stirred, ice-cooled mixture of **10a**,**b** (60 mg, 0.136 mmol) in THF (3.0 ml) and *N*-methylmorpholine (50 mg, 0.49 mmol) in THF (1 ml) was added ethyl chloroformate (50 mg, 0.46 mmol) in THF (1 ml). After 30 min, solns. of Et_3N (50 mg, 0.49 mmol) in CH_2Cl_2 (2 ml) and *N*-hydroxy-2-thiopyridone (50 mg, 0.39 mmol) in CH_2Cl_2 (2 ml) were added consecutively, followed by a soln. of diphenyldiselane ($PhSe_2Ph$; 150 mg, 0.48 mmol) in CH_2Cl_2 (2 ml) all at once. After another 30 min, the yellow-colored mixture was cooled in an ice bath, and irradiated at 300 nm with a *Rayonet* photochemical apparatus for 1 h. Workup involved dilution with CH_2Cl_2 (10 ml), washing with 5% aq. HCl, brine, drying, concentration *in vacuo*, and CC (AcOEt/hexane 1:5 → 9:5): **12a** (25 mg, 41%) and **12b** (15 mg, 24%).

Data of **12a**. Colorless oil. IR: 1730, 1662 (C=O). ^{1}H-NMR: 0.35 (*t*, *J* = 7.5, 3 H); 1.03–1.16 (*m*, 2 H); 1.52–1.66 (*m*, 1 H); 1.69 (*s*, 9 H); 1.74–1.84 (*m*, 1 H); 1.91 (*td*, *J* = 13.4, 5.1, 1 H); 2.07 (*td*, *J* = 13.4, 4.2, 1 H); 2.41–2.53 (*m*, 2 H); 2.59–2.89 (*m*, 4 H); 3.04 (*td*, *J* = 12.0, 4.8, 1 H); 4.82–4.87 (*m*, 1 H); 5.60 (*s*, 1 H); 7.16–7.34 (*m*, 5 H); 7.41–7.46 (*m*, 3 H); 7.98 (*d*, *J* = 8.2, 1 H). ^{13}C-NMR: 7.84 (*q*); 20.98 (*t*); 23.07 (*t*); 25.78 (*t*); 28.43 (*q*); 30.06 (*t*); 31.02 (*t*); 35.68 (*t*); 39.10 (*t*); 44.67 (*s*); 58.89 (*d*); 84.92 (*s*); 115.92 (*d*); 118.21 (*d*); 122.78 (*s*); 123.08 (*d*); 124.76 (*d*); 126.85 (*d*); 128.22 (*s*); 128.98 (*d*); 130.42 (*s*); 132.54 (*d*); 132.84 (*s*); 137.20 (*s*); 151.23 (*s*); 172.67 (*s*). EI-MS: 552 (80, M^+), 550 (43), 339 (48), 295 (23), 256 (83), 214 (90), 169 (100). HR-MS: 552.1864 (M^+, $C_{30}H_{36}N_2O_3Se^+$; calc. 552.1911).

Data of **12b**. Colorless oil. IR: 1732, 1664 (C=O). ^{1}H-NMR: 0.89 (*t*, *J* = 7.5, 3 H); 1.33–1.91 (*m*, 7 H); 1.65 (*s*, 9 H); 2.36–2.52 (*m*, 4 H); 2.71 (*d*, *J* = 16.2, 1 H); 2.81 (*td*, *J* = 12.3, 3.3, 1 H); 4.76–4.81 (*m*, 1 H); 5.46 (*s*, 1 H); 7.03–7.18 (*m*, 5 H); 7.25–7.36 (*m*, 2 H); 7.45 (*d*, *J* = 7.5, 1 H); 7.92 (*d*, *J* = 7.5, 1 H). ^{13}C-NMR: 8.61 (*q*); 20.84 (*t*); 22.29 (*t*); 27.26 (*t*); 28.16 (*q*); 30.04 (*t*); 31.33 (*t*); 34.89 (*t*); 39.14 (*t*); 44.79 (*s*); 58.63 (*d*); 84.53 (*s*); 115.39 (*d*); 118.53 (*d*); 122.63 (*s*); 123.08 (*d*); 124.87 (*d*); 127.01 (*d*); 127.96 (*s*); 128.86 (*d*); 129.28 (*s*); 132.69 (*s*); 133.43 (*d*); 137.02 (*s*); 151.09 (*s*); 172.86 (*s*). EI-MS: 552 (9, M^+), 452 (17), 339 (18), 295 (15), 256 (27), 214 (45), 169 (100). HR-MS: 552.1906 (M^+, $C_{30}H_{36}N_2O_3Se^+$; calc. 552.1911).

*(1*RS,*12b*SR*)-1-Ethyl-2,3,6,7,12,12b-hexahydro-1-[2-(phenylseleno)ethyl]indolo[2,3*-a]*quinolizin-4-(1*H*)-one* (**13a**). A soln. of **12a** (30 mg, 0.054 mmol) in MeOH (5.0 ml) was stirred with 50% aq. KOH soln. (500 mg) at r.t. for 2 d. Workup involved dilution with H_2O (10 ml) and CH_2Cl_2 (15 ml), layer separation, washing with H_2O, brine, drying, evaporation, and CC (AcOEt/hexane 1:1): **13a** (20 mg, 81%). Colorless oil. IR: 1621 (C=O). ^{1}H-NMR: 0.67 (*t*, *J* = 7.5, 3 H); 0.81–0.91 (*m*, 1 H); 1.32–1.42 (*m*, 1 H); 1.63–1.69 (*m*, 1 H); 1.86–2.08 (*m*, 2 H); 2.16–2.27 (*m*, 1 H); 2.36–2.53 (*m*, 2 H); 2.55–2.74 (*m*, 4 H); 2.99–3.15 (*m*, 2 H); 4.84 (*s*, 1 H); 5.08–5.12 (*m*, 1 H); 7.05–7.15 (*m*, 3 H); 7.32 (br. *s*, 1 H); 7.35–7.46 (*m*, 4 H); 7.64–7.67 (*m*, 1 H). ^{13}C-NMR (75 MHz): 7.02 (*q*); 21.04 (*t*); 22.08 (*t*); 24.12 (*t*); 26.87 (*t*); 28.84 (*t*); 38.41 (*t*); 40.47 (*s*); 40.90 (*t*); 60.18 (*d*); 111.01 (*d*); 113.51 (*s*); 118.09 (*d*); 119.79 (*d*); 122.20 (*d*); 126.23 (*s*); 128.18 (*d*); 128.98 (*s*); 129.69 (*d*); 130.42 (*s*); 134.07 (*d*); 135.99 (*s*); 169.86 (*s*). EI-MS: 452 (37, M^+), 450 (20), 295 (18), 251 (18), 212 (49), 170 (100), 169 (69). HR-MS: 452.1386 (M^+, $C_{25}H_{28}N_2OSe^+$; calc. 452.1386).

*(1*RS,*12b*RS*)-1-Ethyl-2,3,6,7,12,12b-hexahydro-1-[2-(phenylseleno)ethyl]indolo[2,3*-a]*quinolizin-4-(1*H*)-one* (**13b**). A soln. of **12b** (20 mg, 0.036 mmol) in MeOH (5.0 ml) was stirred with 50% aq. KOH soln. (500 mg) at r.t. for 2 d. The mixture was diluted with H_2O (10 ml) and CH_2Cl_2 (15 ml), the org. layer was washed with H_2O and brine, dried, and evaporated, and the residue was subjected to CC (AcOEt/hexane 1:1): **13b** (15 mg, 92%). Colorless solid. M.p. 177–179° (lit. m.p. 180–181° [12d]). IR: 3308, 3055, 2961, 2928, 2878 (CH), 1622 (C=O). ^{1}H-NMR: 1.13 (*t*, *J* = 7.5, 3 H); 1.48 (*dt*, *J* = 13.2, 4.8,

1 H); 1.55–1.94 (*m*, 5 H); 2.29–2.54 (*m*, 3 H); 2.58–2.74 (*m*, 4 H); 4.75 (*s*, 1 H); 5.02–5.12 (*m*, 1 H); 7.06–7.40 (*m*, 7 H); 7.32 (*d*, *J* = 7.2, 1 H); 7.51 (*d*, *J* = 7.2, 1 H); 7.82 (*s*, 1 H). ^{13}C-NMR: 8.14 (*q*); 20.95 (*t*); 21.84 (*t*); 27.76 (*t*); 28.85 (*t*); 29.91 (*t*); 33.04 (*t*); 40.49 (*s*); 40.82 (*t*); 60.34 (*d*); 110.94 (*d*); 113.39 (*s*); 118.29 (*d*); 119.90 (*d*); 122.37 (*d*); 126.37 (*s*); 127.20 (*d*); 128.97 (*d*); 129.42 (*s*); 130.42 (*s*); 133.25 (*d*); 136.09 (*s*); 169.84 (*s*). EI-MS: 452 (31, M^+), 450 (19), 294 (42), 251 (19), 212 (46), 170 (100), 169 (92). HR-MS: 452.1350 (M^+, $C_{25}H_{28}N_2OSe^+$; calc. 452.1386).

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