IUCrData

ISSN 2414-3146

# *tert*-Butyl 2,3-dihydro-1*H*-cyclopenta[*b*]indole-4-carboxylate

Jason A. Jordon,[a] Jeanese C. Badenock,[a] Gordon W. Gribble,[b] Manpreet Kaur[c] and Jerry P. Jasinski[c]*

[a]Department of Biological and Chemical Sciences, University of the West Indies, Cave Hill, Barbados, [b]Department of Chemistry, Dartmouth College, Hanover, NH 03755-3564, USA, and [c]Department of Chemistry, Keene State College, 229 Main Street, Keene, NH 03435-2001, USA. *Correspondence e-mail: jjasinski@keene.edu

Received 1 September 2016
Accepted 16 September 2016

Edited by R. J. Butcher, Howard University, USA

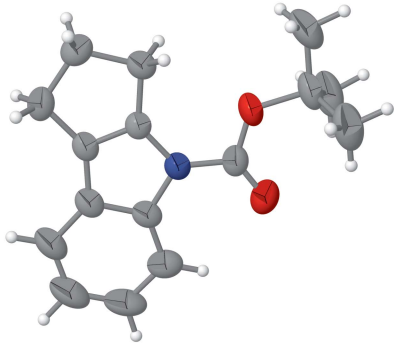
**Keywords:** crystal structure; $\pi$–$\pi$ stacking interactions; C—H$\cdots\pi$ interactions; mirror plane.

**CCDC reference**: 1504684

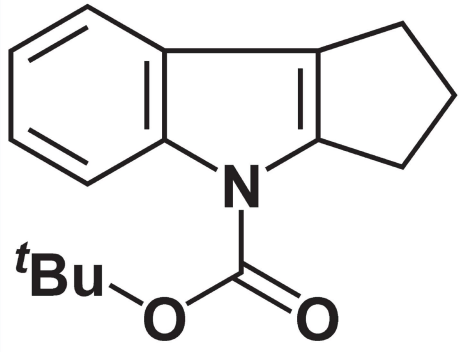
**Structural data**: full structural data are available from iucrdata.iucr.org

In the title molecule, $C_{16}H_{19}NO_2$, all the non-hydrogen atoms except two of the C atoms of the *tert*-butyl group lie on a crystallographic mirror plane. No classical hydrogen bonds are observed. The crystal packing is influenced by weak $\pi$–$\pi$ and C—H$\cdots\pi$ interactions.

3D view



Chemical scheme




## Structure description

We report herein the crystal structure of the title compound, which confirms the previously assigned structure in which it was envisioned that the coupling of an indole with a protected hydroxyl benzaldehyde appendage would install the required vinyl group found in the target molecules Prenostodione, Scytonemin and Nostodione (Macor *et al.*, 1989; Badenock *et al.*, 2013). As such, and in preparation for the coupling, commercially available 1,2,3,4-tetrahydrocyclopenta[*b*]indole was converted to the N-BOC derivative using a standard protection protocol in 87% yield. All the atoms except C15 (see Fig. 1) lie on a crystallographic mirror plane: the second methyl group outside the mirror plane is symmetry related and generates the third methyl group in the *tert*-butyl group.

In the crystal, the molecules are in parallel layers alternately inverted along the *c* axis, parallel to the *ac* plane (Fig2. 2 and 3). The crystal packing is influenced by weak $\pi$–$\pi$ [*Cg*1–*Cg*1 and *Cg*1–*Cg*2; *Cg*1–*Cg*1 = 3.8718 (5) Å and *Cg*1–*Cg*2 = 3.7142 (4) Å, where *Cg*1 is the centroid of the N1/C1/C5/C6/C11 eing and *Cg*2 is the centroid of the C1–C5 ring] stacking interactions involving the pyrrole and cyclopentyl moieties and C2—H2(*A*/*B*)$\cdots$*Cg*3($\pi$) [C—H$\cdots\pi$ distance = 2.8 (8) Å; symmetry code: $-x+1, y+\frac{1}{2}$ (H2*A*) or $y-\frac{1}{2}$ (H2*B*), $-z+2$; where *Cg*3 is the centroid of the C6–C11 ring] interactions involving the benzene ring.

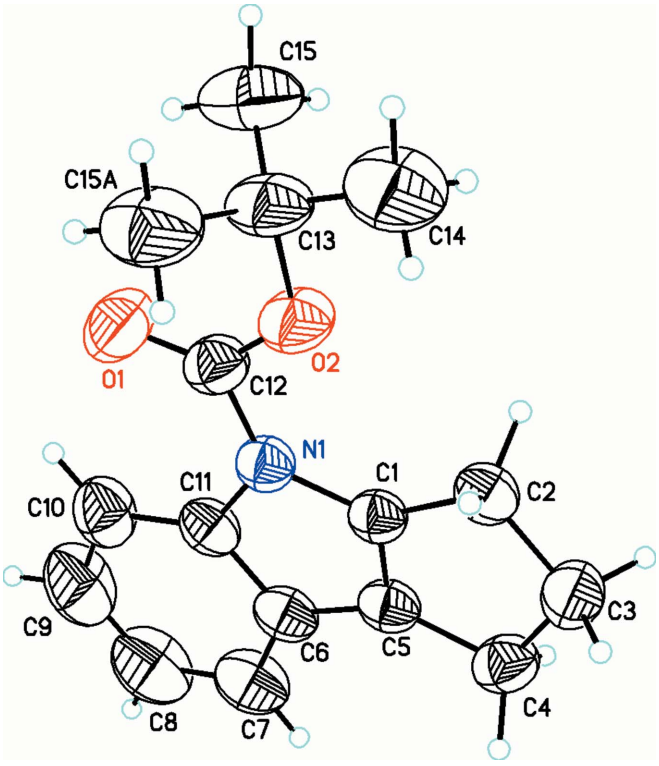



**Figure 1**
The molecular structure of the title compound, showing the atom-labeling scheme. Displacement ellipsoids are drawn at the 50% probability level.

**Table 1**
Experimental details.

| | |
|---|---|
| Crystal data | |
| Chemical formula | $C_{16}H_{19}NO_2$ |
| $M_r$ | 257.32 |
| Crystal system, space group | Orthorhombic, *Pnma* |
| Temperature (K) | 173 |
| *a*, *b*, *c* (Å) | 19.6761 (11), 7.2330 (4), 9.9258 (7) |
| *V* (Å$^3$) | 1412.61 (15) |
| *Z* | 4 |
| Radiation type | Mo *Kα* |
| $\mu$ (mm$^{-1}$) | 0.08 |
| Crystal size (mm) | 0.38 × 0.26 × 0.15 |
| | |
| Data collection | |
| Diffractometer | Rigaku-Oxford Diffraction |
| Absorption correction | Multi-scan (*CrysAlis PRO* & *CrysAlis RED*; Rigaku-Oxford Diffraction, 2012) |
| $T_{min}$, $T_{max}$ | 0.970, 0.988 |
| No. of measured, independent and observed [$I > 2\sigma(I)$] reflections | 12388, 1808, 1486 |
| $R_{int}$ | 0.029 |
| (sin $\theta/\lambda)_{max}$ (Å$^{-1}$) | 0.658 |
| | |
| Refinement | |
| $R[F^2 > 2\sigma(F^2)]$, $wR(F^2)$, *S* | 0.056, 0.147, 1.11 |
| No. of reflections | 1808 |
| No. of parameters | 113 |
| H-atom treatment | H-atom parameters constrained |
| $\Delta\rho_{max}$, $\Delta\rho_{min}$ (e Å$^{-3}$) | 0.16, −0.18 |

Computer programs: *CrysAlis PRO* (Rigaku-Oxford Diffraction, 2012), *CrysAlis RED* (Rigaku-Oxford Diffraction, 2012), *SHELXL2014* (Sheldrick, 2015*b*), *SHELXT* (Sheldrick, 2015*a*) and *OLEX2* (Dolomanov *et al.*, 2009).

## Synthesis and crystallization

To a stirred solution of 1,2,3,4-tetrahydrocyclopenta[*b*]indole (2.48 g, 15.7 mmol, 1.0 equivalent) in freshly distilled THF (75 ml) was added DMAP (0.10 g, 0.79 mmol, 0.05 equivalents) and di-*tert*-butyl dicarbonate (5.31 g, 24.3 mmol, 1.5 equivalents), and the resulting mixture allowed to stir at room temperature overnight (Grehn & Ragnarsson, 1984). The solvent was removed *via* rotary evaporation and the subsequent brown residue was absorbed directly onto silica and purified using flash column chromatography (9:1 hexanes–ethyl acetate). *tert*-Butyl 2,3-dihydro-1*H*-cyclopenta[*b*]indole-4-carboxylate was obtained as a pale-yellow solid (yield 3.53 g, 87%). Crystals suitable for X-ray diffraction were recrystallized from methanol solution (m.p. 389.0–389.4 K). $^1$H NMR ($CDCl_3$): $\delta$ 8.15–8.17 (*d*, *J* = 7.5 Hz, 1H), 7.33–7.35 (*m*, 1H), 7.16–7.23 (*m*, 2H), 3.04–3.07 (*m*, 2H), 2.72–2.76 (*m*, 2H), 2.42–2.49 (*m*, 2H), 1.63 (*s*, 9H); $^{13}$C NMR ($CDCl_3$): $\delta$ 150.1,

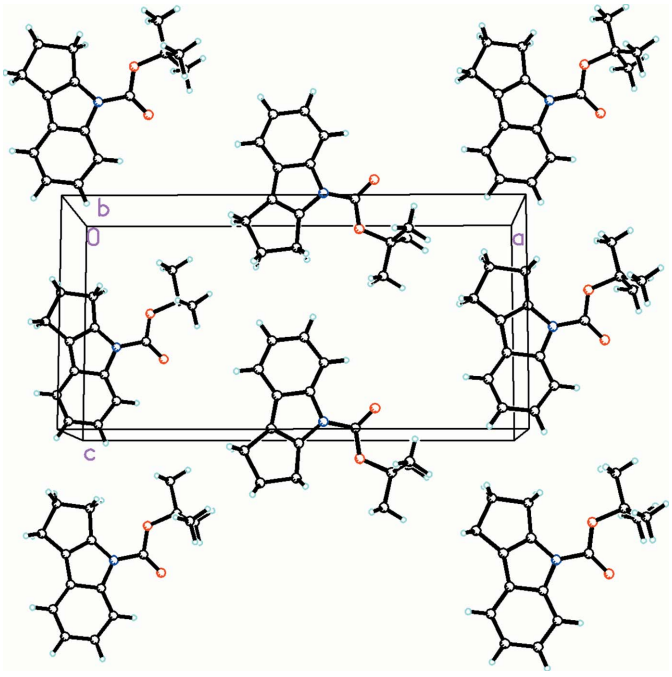



**Figure 2**
The packing of the title compound, viewed along the *b* axis.

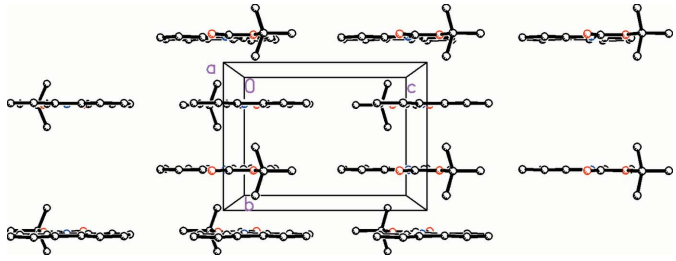



**Figure 3**
Part of the crystal structure of the title compound, showing the planes of molecules arranged in parallel layers alternately inverted along the *c* axis, parallel to the *ac* plane.

144.1, 140.2, 126.9, 124.5, 122.9, 122.6, 118.6, 115.8, 83.0, 29.2, 28.3, 27.5, 24.1; IR $\nu$ film) 3315, 3053, 2980, 2860, 1727, 1611,1476, 1453 $cm^{-1}$; UV $\lambda_{max}$ (95% EtOH) 204, 230, 272 nm. Analysis calculated for $C_{16}H_{19}NO_2$: C 74.68, H 7.44, N 5.44%; found: C 74.63, H 7.33, N 5.50.

## Refinement

Crystal data, data collection and structure refinement details are summarized in Table 1.

## Acknowledgements

JCB wishes to thank the School of Graduate Studies and Research, UWI and the Government of Barbados for the funding of this research. JPJ acknowledges the NSF–MRI program (grant No. CHE-0619278) for funds to purchase the X-ray diffractometer.

## References

Badenock, J. C., Jordan, J. A. & Gribble, G. W. (2013). *Tetrahedron Lett.* **54**, 2759–2762.
Dolomanov, O. V., Bourhis, L. J., Gildea, R. J., Howard, J. A. K. & Puschmann, H. (2009). *J. Appl. Cryst.* **42**, 339–341.
Grehn, L. & Ragnarsson, U. (1984). *Angew. Chem. Int. Ed.* **96**, 296–301.
Macor, J. E., Ryan, K. & Newman, M. E. (1989). *Tetrahedron Lett.* **30**, 2509–2512.
Rigaku-Oxford Diffraction (2012). *CrysAlis PRO* and *CrysAlis RED*. Rigaku Americas Corporation, The Woodlands, Texas, USA.
Sheldrick, G. M. (2015*a*). *Acta Cryst.* A**71**, 3–8.
Sheldrick, G. M. (2015*b*). *Acta Cryst.* C**71**, 3–8.

# full crystallographic data

*IUCrData* (2016). **1**, x161468 [doi:10.1107/S2414314616014681]

## *tert*-Butyl 2,3-dihydro-1*H*-cyclopenta[*b*]indole-4-carboxylate

**Jason A. Jordon, Jeanese C. Badenock, Gordon W. Gribble, Manpreet Kaur and Jerry P. Jasinski**

### *tert*-Butyl 2,3-dihydro-1*H*-cyclopenta[*b*]indole-4-carboxylate

*Crystal data*

$C_{16}H_{19}NO_2$
$M_r$ = 257.32
Orthorhombic, *Pnma*
*a* = 19.6761 (11) Å
*b* = 7.2330 (4) Å
*c* = 9.9258 (7) Å
*V* = 1412.61 (15) Å$^3$
*Z* = 4
*F*(000) = 552
$D_x$ = 1.210 Mg m$^{-3}$
Mo *Kα* radiation, $\lambda$ = 0.71073 Å
Cell parameters from 4596 reflections
$\theta$ = 3.5–32.3°
$\mu$ = 0.08 mm$^{-1}$
*T* = 173 K
Block, colourless
0.38 × 0.26 × 0.15 mm

*Data collection*

Rigaku-Oxford Diffraction diffractometer
Detector resolution: 16.1500 pixels mm$^{-1}$
$\omega$ scans
Absorption correction: multi-scan (CrysAlis PRO & CrysAlis RED; Rigaku-Oxford Diffraction, 2012)
$T_{min}$ = 0.970, $T_{max}$ = 0.988
12388 measured reflections
1808 independent reflections
1486 reflections with $I > 2\sigma(I)$
$R_{int}$ = 0.029
$\theta_{max}$ = 27.9°, $\theta_{min}$ = 3.5°
*h* = −25→24
*k* = −9→8
*l* = −12→13

*Refinement*

Refinement on $F^2$
Least-squares matrix: full
$R[F^2 > 2\sigma(F^2)]$ = 0.056
$wR(F^2)$ = 0.147
*S* = 1.11
1808 reflections
113 parameters
0 restraints
Primary atom site location: structure-invariant direct methods
Hydrogen site location: inferred from neighbouring sites
H-atom parameters constrained
$w = 1/[\sigma^2(F_o^2) + (0.0562P)^2 + 0.394P]$ where $P = (F_o^2 + 2F_c^2)/3$
$(\Delta/\sigma)_{max} < 0.001$
$\Delta\rho_{max}$ = 0.16 e Å$^{-3}$
$\Delta\rho_{min}$ = −0.18 e Å$^{-3}$

*Special details*

**Geometry**. All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

*Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (Å²)*

| | *x* | *y* | *z* | $U_{iso}$*/$U_{eq}$ | Occ. (<1) |
|---|---|---|---|---|---|
| O1 | 0.32442 (9) | 0.2500 | 1.10343 (19) | 0.0736 (6) | |
| O2 | 0.35771 (8) | 0.2500 | 0.88593 (17) | 0.0631 (5) | |
| N1 | 0.43643 (8) | 0.2500 | 1.04482 (17) | 0.0438 (4) | |
| C1 | 0.49003 (10) | 0.2500 | 0.9521 (2) | 0.0408 (4) | |
| C2 | 0.49512 (11) | 0.2500 | 0.8034 (2) | 0.0484 (5) | |
| H2A | 0.4739 | 0.3616 | 0.7640 | 0.058* | 0.5 |
| H2B | 0.4739 | 0.1384 | 0.7640 | 0.058* | 0.5 |
| C3 | 0.57309 (12) | 0.2500 | 0.7828 (2) | 0.0586 (6) | |
| H3A | 0.5869 | 0.1391 | 0.7311 | 0.070* | 0.5 |
| H3B | 0.5869 | 0.3609 | 0.7311 | 0.070* | 0.5 |
| C4 | 0.60802 (11) | 0.2500 | 0.9211 (2) | 0.0547 (6) | |
| H4A | 0.6366 | 0.1385 | 0.9331 | 0.066* | 0.5 |
| H4B | 0.6366 | 0.3615 | 0.9331 | 0.066* | 0.5 |
| C5 | 0.54989 (10) | 0.2500 | 1.0164 (2) | 0.0442 (5) | |
| C6 | 0.53714 (12) | 0.2500 | 1.1579 (2) | 0.0490 (5) | |
| C7 | 0.57817 (15) | 0.2500 | 1.2717 (3) | 0.0674 (7) | |
| H7 | 0.6263 | 0.2500 | 1.2632 | 0.081* | |
| C8 | 0.5485 (2) | 0.2500 | 1.3961 (3) | 0.0874 (10) | |
| H8 | 0.5765 | 0.2500 | 1.4741 | 0.105* | |
| C9 | 0.4784 (2) | 0.2500 | 1.4109 (3) | 0.0863 (10) | |
| H9 | 0.4594 | 0.2500 | 1.4989 | 0.104* | |
| C10 | 0.43543 (15) | 0.2500 | 1.3003 (2) | 0.0652 (7) | |
| H10 | 0.3874 | 0.2500 | 1.3104 | 0.078* | |
| C11 | 0.46572 (12) | 0.2500 | 1.1746 (2) | 0.0471 (5) | |
| C12 | 0.36713 (10) | 0.2500 | 1.0180 (2) | 0.0513 (5) | |
| C13 | 0.28904 (12) | 0.2500 | 0.8262 (3) | 0.0673 (7) | |
| C14 | 0.30593 (17) | 0.2500 | 0.6773 (3) | 0.0996 (12) | |
| H14A | 0.2638 | 0.2500 | 0.6248 | 0.149* | |
| H14B | 0.3325 | 0.3606 | 0.6554 | 0.149* | 0.5 |
| H14C | 0.3325 | 0.1394 | 0.6554 | 0.149* | 0.5 |
| C15 | 0.25196 (10) | 0.0761 (3) | 0.8664 (2) | 0.0919 (8) | |
| H15A | 0.2814 | −0.0311 | 0.8514 | 0.138* | |
| H15B | 0.2106 | 0.0635 | 0.8121 | 0.138* | |
| H15C | 0.2397 | 0.0830 | 0.9620 | 0.138* | |

*Atomic displacement parameters (Å²)*

| | $U^{11}$ | $U^{22}$ | $U^{33}$ | $U^{12}$ | $U^{13}$ | $U^{23}$ |
|---|---|---|---|---|---|---|
| O1 | 0.0494 (9) | 0.0972 (14) | 0.0743 (12) | 0.000 | 0.0089 (8) | 0.000 |
| O2 | 0.0406 (8) | 0.0872 (12) | 0.0614 (10) | 0.000 | −0.0137 (7) | 0.000 |
| N1 | 0.0427 (9) | 0.0436 (9) | 0.0450 (9) | 0.000 | −0.0029 (7) | 0.000 |
| C1 | 0.0421 (10) | 0.0340 (9) | 0.0463 (11) | 0.000 | −0.0026 (8) | 0.000 |
| C2 | 0.0525 (12) | 0.0462 (11) | 0.0466 (11) | 0.000 | −0.0054 (9) | 0.000 |
| C3 | 0.0579 (13) | 0.0584 (13) | 0.0596 (14) | 0.000 | 0.0092 (11) | 0.000 |
| C4 | 0.0433 (11) | 0.0507 (12) | 0.0701 (15) | 0.000 | −0.0006 (10) | 0.000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| C5 | 0.0453 (10) | 0.0363 (9) | 0.0511 (11) | 0.000 | −0.0081 (9) | 0.000 |
| C6 | 0.0559 (12) | 0.0384 (10) | 0.0526 (12) | 0.000 | −0.0109 (10) | 0.000 |
| C7 | 0.0740 (17) | 0.0687 (15) | 0.0596 (15) | 0.000 | −0.0255 (13) | 0.000 |
| C8 | 0.111 (3) | 0.097 (2) | 0.0548 (16) | 0.000 | −0.0305 (17) | 0.000 |
| C9 | 0.122 (3) | 0.095 (2) | 0.0414 (13) | 0.000 | −0.0040 (15) | 0.000 |
| C10 | 0.0810 (17) | 0.0641 (15) | 0.0506 (13) | 0.000 | 0.0058 (12) | 0.000 |
| C11 | 0.0584 (13) | 0.0382 (10) | 0.0447 (11) | 0.000 | −0.0059 (9) | 0.000 |
| C12 | 0.0426 (11) | 0.0509 (12) | 0.0603 (13) | 0.000 | −0.0022 (10) | 0.000 |
| C13 | 0.0450 (12) | 0.0737 (16) | 0.0832 (18) | 0.000 | −0.0249 (12) | 0.000 |
| C14 | 0.079 (2) | 0.140 (3) | 0.081 (2) | 0.000 | −0.0380 (17) | 0.000 |
| C15 | 0.0649 (12) | 0.0779 (14) | 0.133 (2) | −0.0129 (10) | −0.0315 (12) | 0.0047 (13) |

*Geometric parameters (Å, º)*

| | | | |
|---|---|---|---|
| O1—C12 | 1.194 (3) | C6—C11 | 1.415 (3) |
| O2—C12 | 1.324 (3) | C7—H7 | 0.9500 |
| O2—C13 | 1.476 (3) | C7—C8 | 1.365 (4) |
| N1—C1 | 1.400 (3) | C8—H8 | 0.9500 |
| N1—C11 | 1.411 (3) | C8—C9 | 1.388 (5) |
| N1—C12 | 1.389 (3) | C9—H9 | 0.9500 |
| C1—C2 | 1.479 (3) | C9—C10 | 1.385 (4) |
| C1—C5 | 1.340 (3) | C10—H10 | 0.9500 |
| C2—H2A | 0.9900 | C10—C11 | 1.383 (3) |
| C2—H2B | 0.9900 | C13—C14 | 1.515 (4) |
| C2—C3 | 1.548 (3) | C13—C15$^{i}$ | 1.508 (3) |
| C3—H3A | 0.9900 | C13—C15 | 1.508 (3) |
| C3—H3B | 0.9900 | C14—H14A | 0.9800 |
| C3—C4 | 1.536 (3) | C14—H14B | 0.9800 |
| C4—H4A | 0.9900 | C14—H14C | 0.9800 |
| C4—H4B | 0.9900 | C15—H15A | 0.9800 |
| C4—C5 | 1.484 (3) | C15—H15B | 0.9800 |
| C5—C6 | 1.427 (3) | C15—H15C | 0.9800 |
| C6—C7 | 1.388 (3) | | |
| | | | |
| C12—O2—C13 | 121.74 (19) | C7—C8—H8 | 119.3 |
| C1—N1—C11 | 107.02 (16) | C7—C8—C9 | 121.4 (3) |
| C12—N1—C1 | 127.82 (18) | C9—C8—H8 | 119.3 |
| C12—N1—C11 | 125.16 (18) | C8—C9—H9 | 119.3 |
| N1—C1—C2 | 135.00 (17) | C10—C9—C8 | 121.5 (3) |
| C5—C1—N1 | 110.42 (18) | C10—C9—H9 | 119.3 |
| C5—C1—C2 | 114.58 (19) | C9—C10—H10 | 121.5 |
| C1—C2—H2A | 111.5 | C11—C10—C9 | 116.9 (3) |
| C1—C2—H2B | 111.5 | C11—C10—H10 | 121.5 |
| C1—C2—C3 | 101.51 (17) | N1—C11—C6 | 107.37 (18) |
| H2A—C2—H2B | 109.3 | C10—C11—N1 | 130.4 (2) |
| C3—C2—H2A | 111.5 | C10—C11—C6 | 122.2 (2) |
| C3—C2—H2B | 111.5 | O1—C12—O2 | 127.2 (2) |
| C2—C3—H3A | 109.9 | O1—C12—N1 | 123.7 (2) |

| | | | |
|---|---|---|---|
| C2—C3—H3B | 109.9 | O2—C12—N1 | 109.11 (19) |
| H3A—C3—H3B | 108.3 | O2—C13—C14 | 101.0 (2) |
| C4—C3—C2 | 108.96 (19) | O2—C13—C15 | 109.67 (14) |
| C4—C3—H3A | 109.9 | O2—C13—C15$^{i}$ | 109.67 (14) |
| C4—C3—H3B | 109.9 | C15$^{i}$—C13—C14 | 111.38 (16) |
| C3—C4—H4A | 111.2 | C15—C13—C14 | 111.38 (16) |
| C3—C4—H4B | 111.2 | C15$^{i}$—C13—C15 | 113.0 (2) |
| H4A—C4—H4B | 109.1 | C13—C14—H14A | 109.5 |
| C5—C4—C3 | 103.01 (17) | C13—C14—H14B | 109.5 |
| C5—C4—H4A | 111.2 | C13—C14—H14C | 109.5 |
| C5—C4—H4B | 111.2 | H14A—C14—H14B | 109.5 |
| C1—C5—C4 | 111.95 (19) | H14A—C14—H14C | 109.5 |
| C1—C5—C6 | 108.33 (19) | H14B—C14—H14C | 109.5 |
| C6—C5—C4 | 139.71 (19) | C13—C15—H15A | 109.5 |
| C7—C6—C5 | 134.3 (2) | C13—C15—H15B | 109.5 |
| C7—C6—C11 | 118.8 (2) | C13—C15—H15C | 109.5 |
| C11—C6—C5 | 106.85 (18) | H15A—C15—H15B | 109.5 |
| C6—C7—H7 | 120.4 | H15A—C15—H15C | 109.5 |
| C8—C7—C6 | 119.1 (3) | H15B—C15—H15C | 109.5 |
| C8—C7—H7 | 120.4 | | |

| | | | |
|---|---|---|---|
| N1—C1—C2—C3 | 180.000 (1) | C6—C7—C8—C9 | 0.000 (1) |
| N1—C1—C5—C4 | 180.000 (1) | C7—C6—C11—N1 | 180.000 (1) |
| N1—C1—C5—C6 | 0.000 (1) | C7—C6—C11—C10 | 0.000 (1) |
| C1—N1—C11—C6 | 0.000 (1) | C7—C8—C9—C10 | 0.000 (1) |
| C1—N1—C11—C10 | 180.000 (1) | C8—C9—C10—C11 | 0.000 (1) |
| C1—N1—C12—O1 | 180.000 (1) | C9—C10—C11—N1 | 180.000 (1) |
| C1—N1—C12—O2 | 0.000 (1) | C9—C10—C11—C6 | 0.000 (1) |
| C1—C2—C3—C4 | 0.000 (1) | C11—N1—C1—C2 | 180.000 (1) |
| C1—C5—C6—C7 | 180.000 (1) | C11—N1—C1—C5 | 0.000 (1) |
| C1—C5—C6—C11 | 0.000 (1) | C11—N1—C12—O1 | 0.000 (1) |
| C2—C1—C5—C4 | 0.000 (1) | C11—N1—C12—O2 | 180.000 (1) |
| C2—C1—C5—C6 | 180.000 (1) | C11—C6—C7—C8 | 0.000 (1) |
| C2—C3—C4—C5 | 0.000 (1) | C12—O2—C13—C14 | 180.000 (1) |
| C3—C4—C5—C1 | 0.000 (1) | C12—O2—C13—C15$^{i}$ | 62.35 (18) |
| C3—C4—C5—C6 | 180.000 (1) | C12—O2—C13—C15 | −62.35 (18) |
| C4—C5—C6—C7 | 0.000 (1) | C12—N1—C1—C2 | 0.000 (1) |
| C4—C5—C6—C11 | 180.000 (1) | C12—N1—C1—C5 | 180.000 (1) |
| C5—C1—C2—C3 | 0.000 (1) | C12—N1—C11—C6 | 180.000 (1) |
| C5—C6—C7—C8 | 180.000 (1) | C12—N1—C11—C10 | 0.000 (1) |
| C5—C6—C11—N1 | 0.000 (1) | C13—O2—C12—O1 | 0.000 (1) |
| C5—C6—C11—C10 | 180.000 (1) | C13—O2—C12—N1 | 180.000 (1) |

Symmetry code: (i) $x$, $-y+1/2$, $z$.

*Hydrogen-bond geometry (Å, º)*

| *D*—H···*A* | *D*—H | H···*A* | *D*···*A* | *D*—H···*A* |
|---|---|---|---|---|
| C10—H10···O1 | 0.95 | 2.40 | 2.931 (3) | 115 |

| | | | | |
|---|---|---|---|---|
| C15—H15*C*···O1 | 0.98 | 2.49 | 3.025 (3) | 114 |