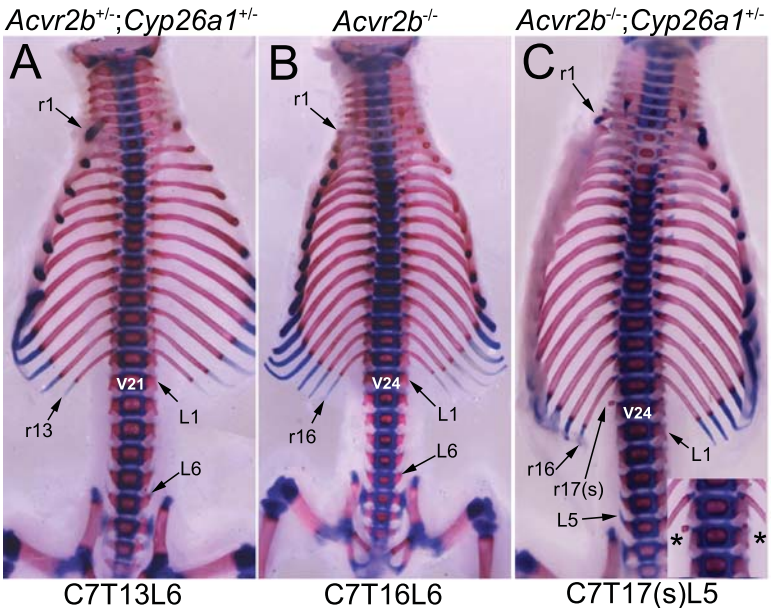
SUPPLEMENTAL FIGURE LEGENDS

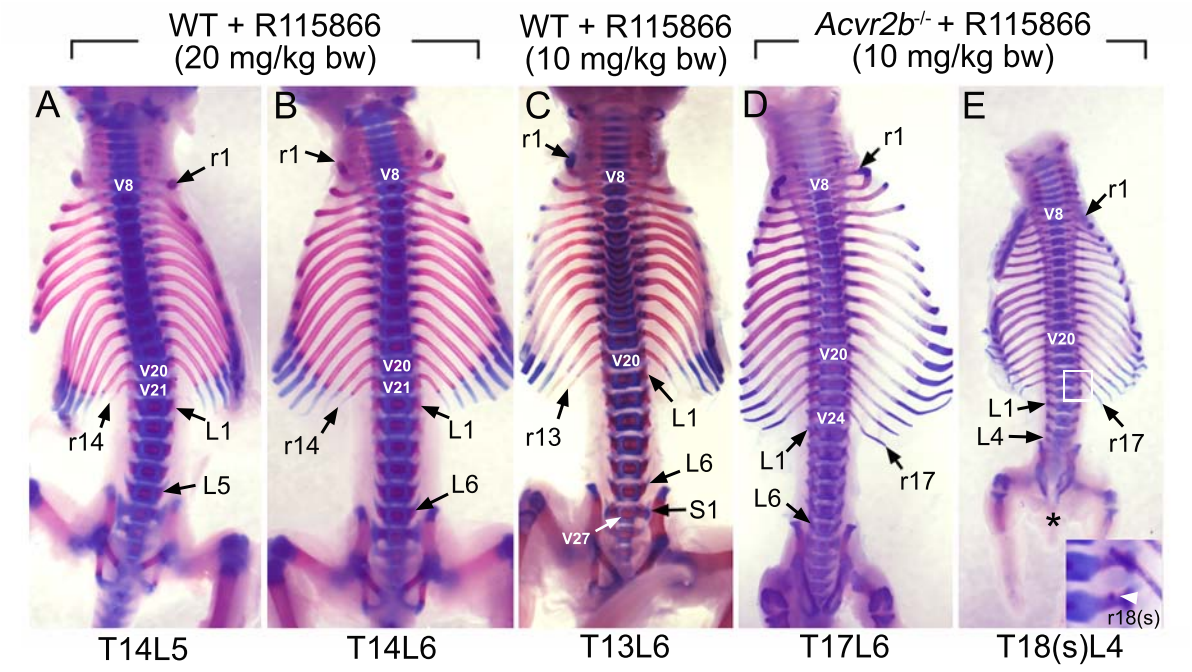
Supplemental Figure 1. Representative axial skeleton patterns of *Acvr2b*$^{+/-}$;*Cyp26a1*$^{+/-}$ (A), *Acvr2b*$^{-/-}$ (B), and *Acvr2b*$^{-/-}$;*Cyp26a1*$^{+/-}$ (C) pups. Note small rib attachments at the 24th vertebra of *Acvr2b*$^{-/-}$;*Cyp26a1*$^{+/-}$ pup (insets in C), which displays the C7T17(s)L5 pattern. Genotypes and vertebral patterns are indicated on top and bottom, respectively.

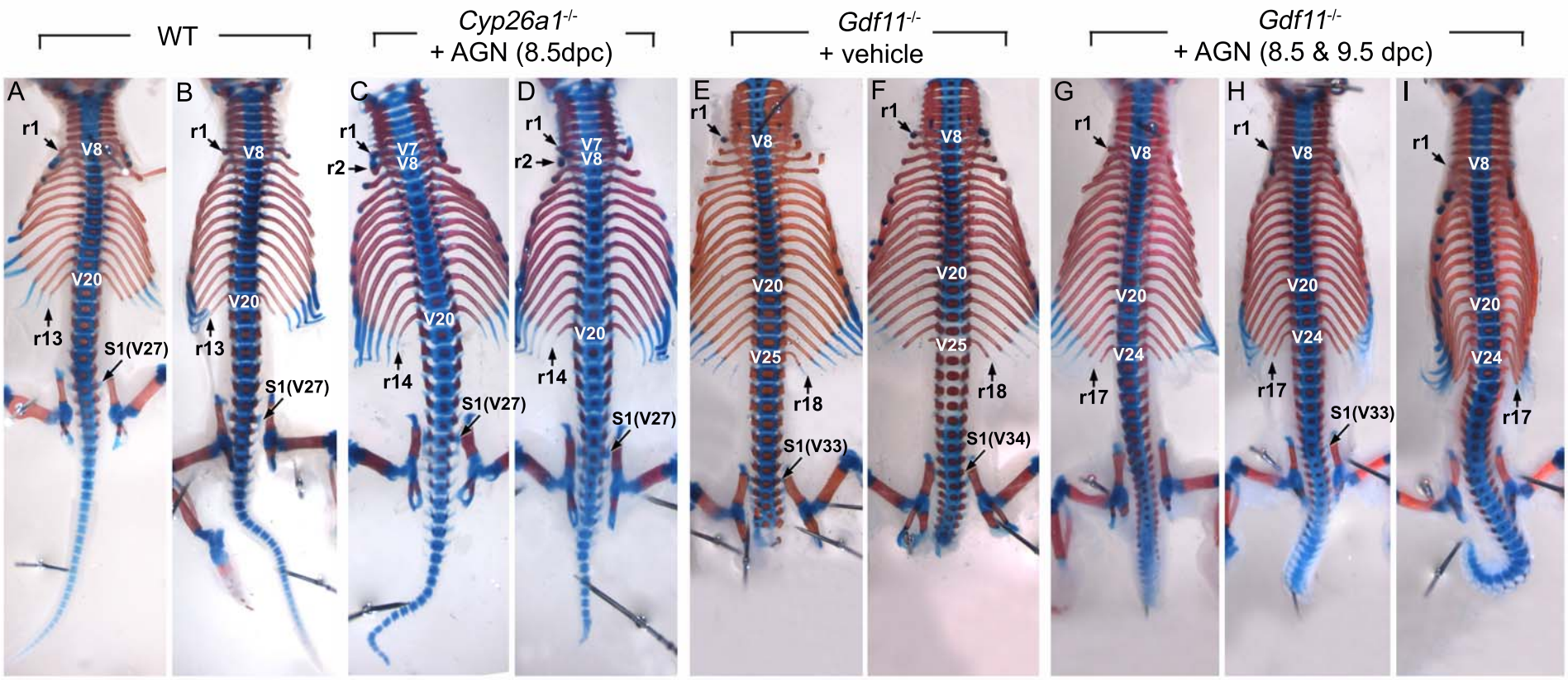
Supplemental Figure 2. Effect of a CYP26 inhibitor (R115866) on vertebral patterning of WT and *Acvr2b*$^{-/-}$ E18.5 embryos. (A, B) Representative axial skeleton patterns of WT embryos treated with R115866 (20 mg/kg bw).. (C, D, E) Representative axial skeleton patterns of WT (C) and *Acvr2b*$^{-/-}$ (D, E) embryos treated with R115866 (10 mg/kg bw). Note severe truncation of tail vertebrae (* in E) and a small rib attachment (insets in E) of an *Acvr2b*$^{-/-}$embryo. Genotypes and vertebral patterns are indicated on top and bottom, respectively.

Supplemental Figure 3. Effect of a pan retinoic acid receptor antagonist (AGN193109) on vertebral transformation and tail truncation phenotypes of *Cyp26a1*$^{-/-}$and *Gdf11*$^{-/-}$ mice. Representative ventral views of axial skeletons of WT (A, B), *Cyp26a1*$^{-/-}$ (C, D), and *Gdf11*$^{-/-}$ (E-I) treated with vehicle or AGN193109 (AGN). (A, B) WT skeletons treated with vehicle or AGN show a normal vertebral pattern (C7T13L6S4). Vertebra numbers and rib attachment were indicated. (C, D) AGN-treated *Cyp26a1*$^{-/-}$ skeletons. While AGN treatment almost completely rescued the caudal agenesis defect of *Cyp26a1*$^{-/-}$ fetuses, the posterior transformation phenotype was unaffected: the first ribs were attached to the 7th vertebra in the rescued *Cyp26a1*$^{-/-}$ mice. (E, F) Vehicle-treated *Gdf11*$^{-/-}$ skeletons show the typical C7T18L8S4 pattern with truncation of

caudal vertebrae. (G-I) AGN-treated *Gdf11*$^{-/-}$ skeletons demonstrate significant restoration of tail extension. Anterior transformation was lessened by about one segment from T18 to T17.


Acvr2b+/-;Cyp26a1+/-
Acvr2b-/-
Acvr2b-/-;Cyp26a1+/-
A
B
C
r1
r1
r1
V21
L1
r13
L6
V24
L1
r16
L6
V24
L1
r16
r17(s)
L5
*
*
C7T13L6
C7T16L6
C7T17(s)L5


WT + R115866
(20 mg/kg bw)
WT + R115866
(10 mg/kg bw)
Acvr2b-/- + R115866
(10 mg/kg bw)
A
B
C
D
E
r1
V8
V20
V21
r14
L1
L5
L6
r13
S1
V27
V24
L4
r17
r18(s)
T14L5
T14L6
T13L6
T17L6
T18(s)L4


WT
Cyp26a1-/-
+ AGN (8.5dpc)
Gdf11-/-
+ vehicle
Gdf11-/-
+ AGN (8.5 & 9.5 dpc)
A
B
C
D
E
F
G
H
I
r1
r2
r13
r14
r17
r18
V7
V8
V20
V24
V25
S1(V27)
S1(V33)
S1(V34)