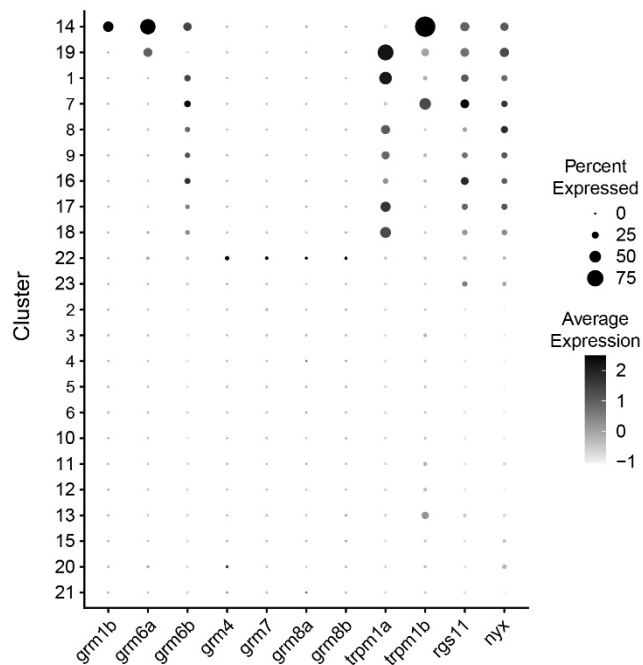## Figure S1

Figure S1. Expression patterns of the identified marker genes in BC clusters

The size of each circle depicts the percentage of cells in the cluster in which the marker was detected (≥1 UMI), and its grey scale depicts the scaled average expression level of cells within the cluster

Figure S2

a

vsx1:memCer

Dorsal   Ventro-temporal

b

vsx2:memCer

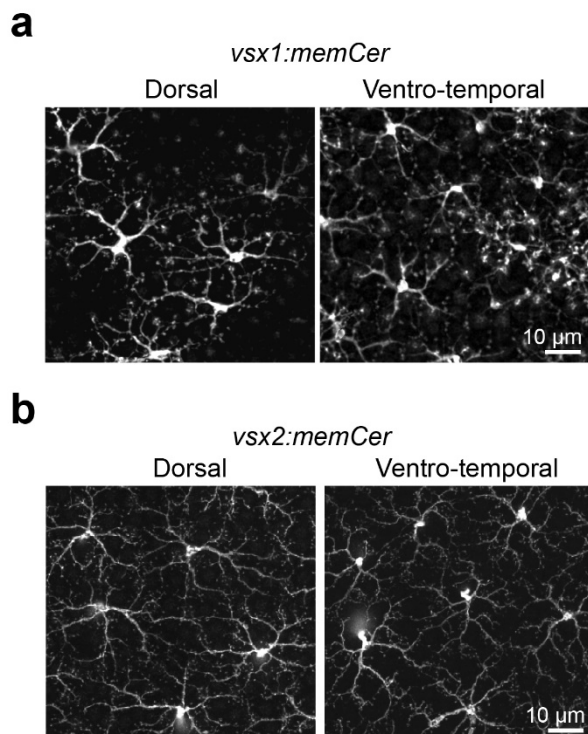Dorsal   Ventro-temporal

Figure S2. Dendritic tiling of RBC1 and RBC2 BCs across the retina

Confocal images of retinal flat mount at outer plexiform layer level from $Tg(vsx1:memCerulean)^{q19}$ (vsx1:memCer) and $Tg(vsx2:memCerulean)^{wst01}$ (vsx2:memCer). Note that the vsx1:memCer line occasionally labels OFF BCs. These BCs were distinguished by tracing the cells to the axon terminals in the confocal image volumes.

11

Figure S3

a

b

OPL
INL
IPL
GCL 10 µm

c   RBC1 Post-synaptic neurons

Side view   En face view

                              IPL

d   RBC2 Post-synaptic neurons

Side view   En face view

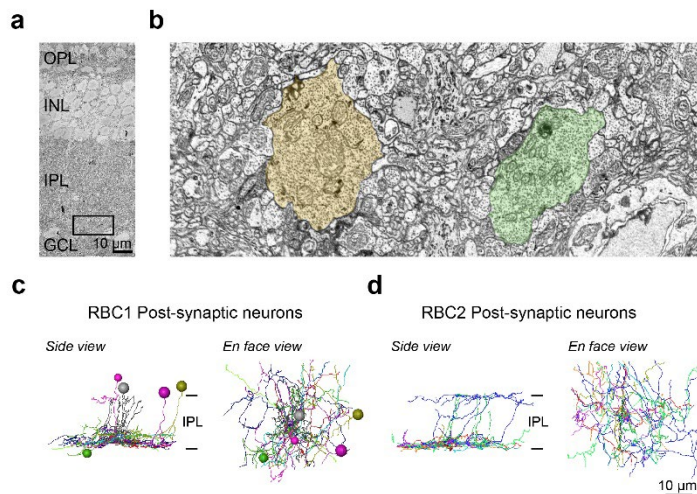   IPL

10 µm

Figure S3. Identification of RBC1 and RBC2 postsynaptic neurons in SBFSEM volume

a, A partial image of an example SEM image of an adult zebrafish retina. OPL (outer plexiform layer), INL (inner nuclear layer), IPL (inner plexiform layer), GCL (ganglion cell

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319 *layer).* **b**, *Magnified image of the region within the black box in* **a** *at the bottom layer of the IPL.*

320 *Characteristic large bipolar cell axons are painted in light yellow and green.* **c,d,** *Traces of*

321 *neuronal processes and the location of somas of cells that are post-synaptic to RBC1 and RBC2*

322 *cells. Individual cells were color coded. IPL: inner plexiform layer.*
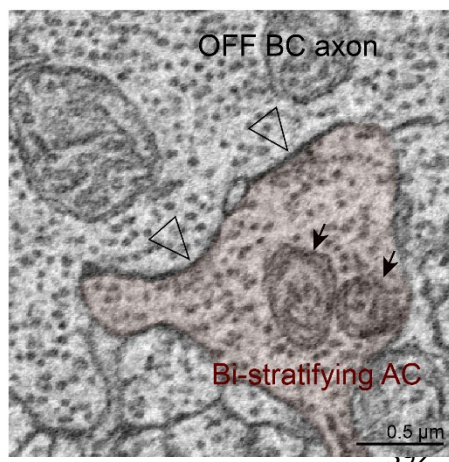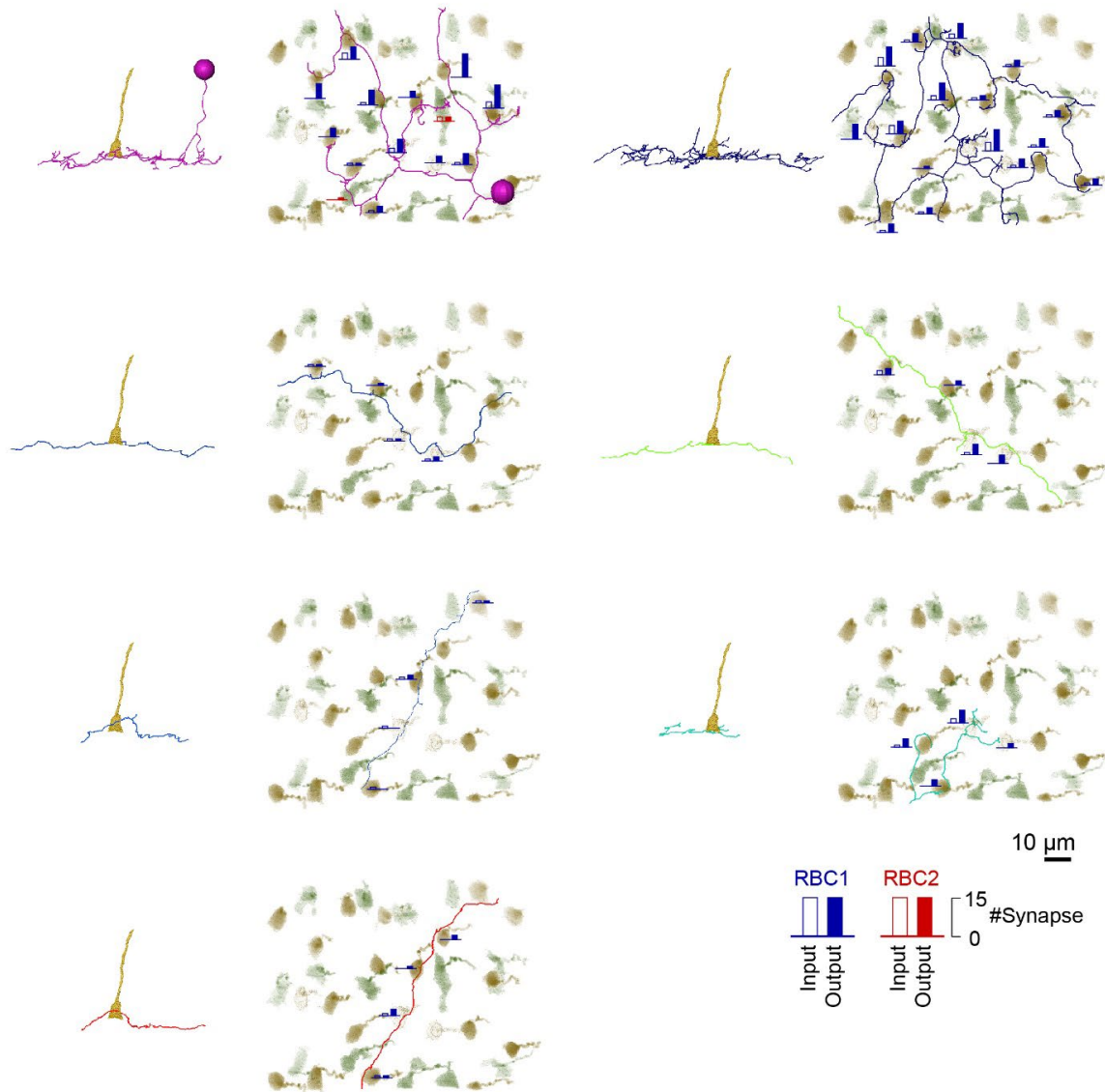
Figure S4

Figure S4. Ultrastructure of the zebrafish A2 AC boutons in the OFF layer

Examples of large synaptic sites (arrowheads) between bi-stratifying A2-like AC and OFF BC axon terminals in the OFF layer. The A2 AC boutons often contain mitochondria (arrows).

Figure S5

Monostratifying-AC with reciprocal synapses (A17-like)

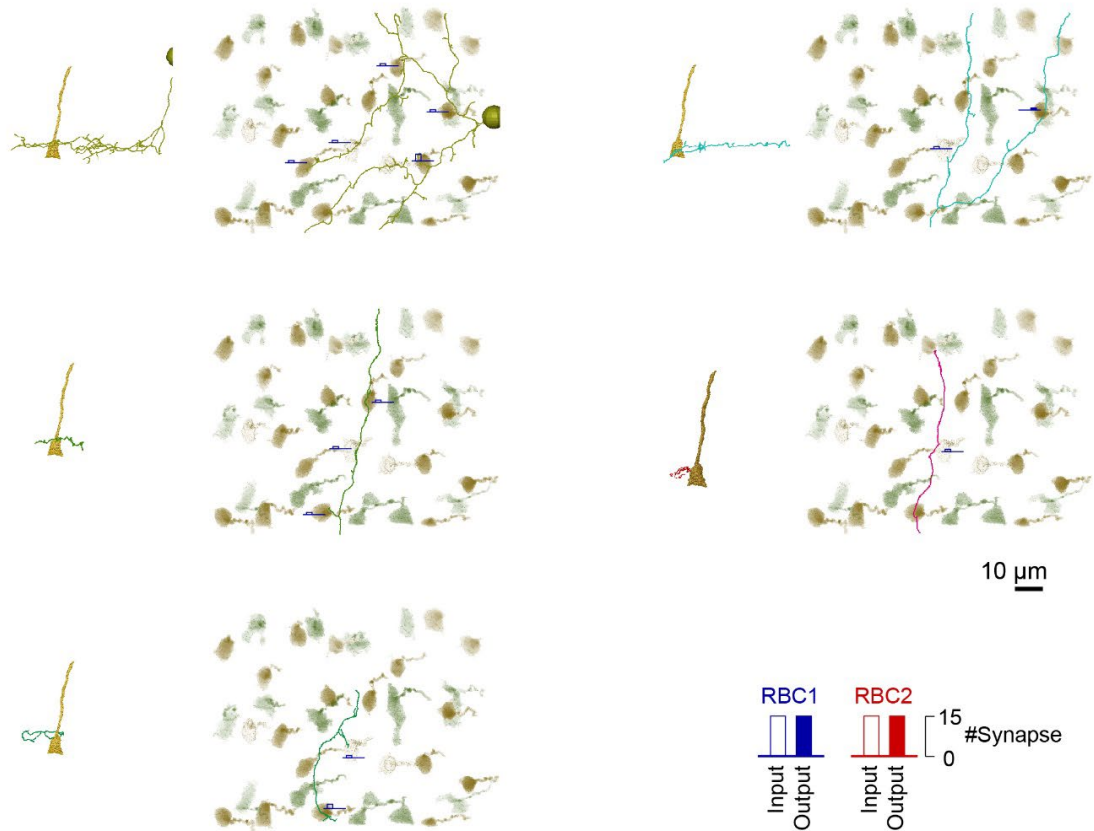752

Figure S5. Gallery of mono-stratifying AC making reciprocal synapses with RBC1

En face and side views of individual cells or processes. The numbers of input (open bar) and output (closed bar) synapses with each RBC1 (blue) and RBC2 (red) terminal are indicated as the height of the bars.

Figure S6

Monostratifying-AC without reciprocal synapses

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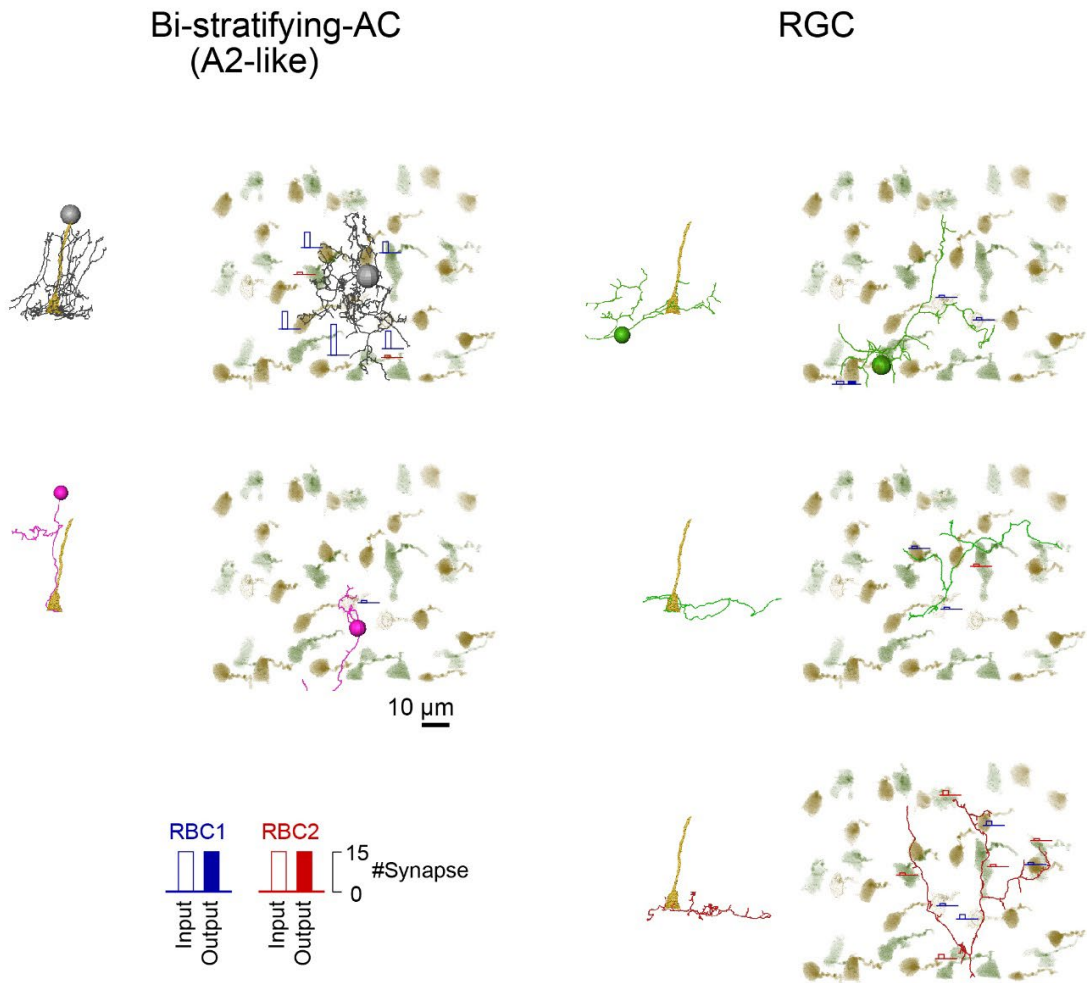**Figure S6. Gallery of mono-stratifying AC without reciprocal synapses with RBC1**

En face and side views of individual cells. The numbers of input (open bar) and output (closed bar) synapses with each RBC1 (blue) and RBC2 (red) terminal are indicated as the height of the bars.

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Figure S7

Figure S7. Gallery of bi-stratifying AC and RGC contacted to RBC1

En face and side views of individual cells. The numbers of input (open bar) and output (closed bar) synapses with each RBC1 (blue) and RBC2 (red) terminal are indicated as the height of the bars.

41

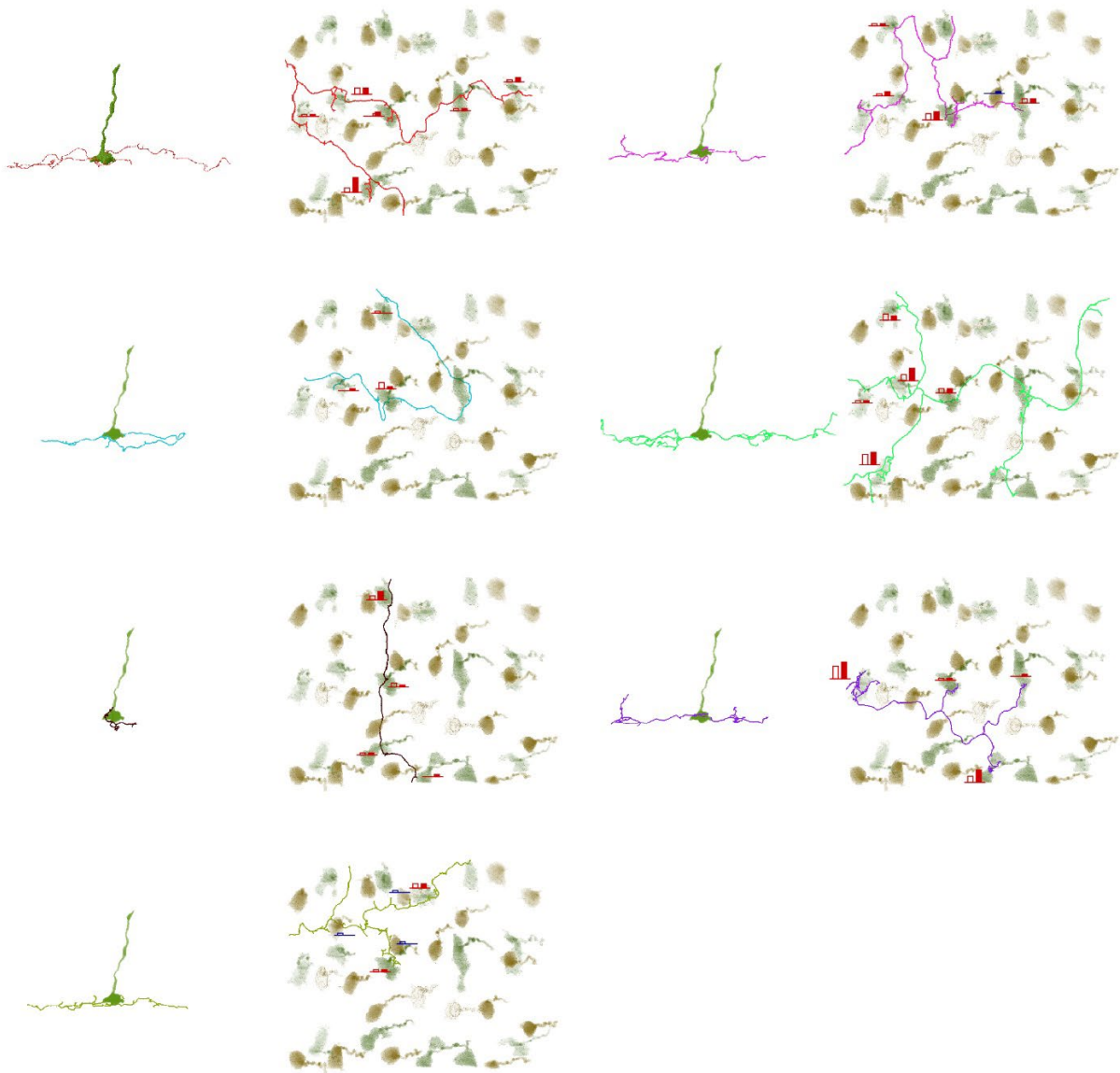# Figure S8

Monostratifying-AC with reciprocal synapses

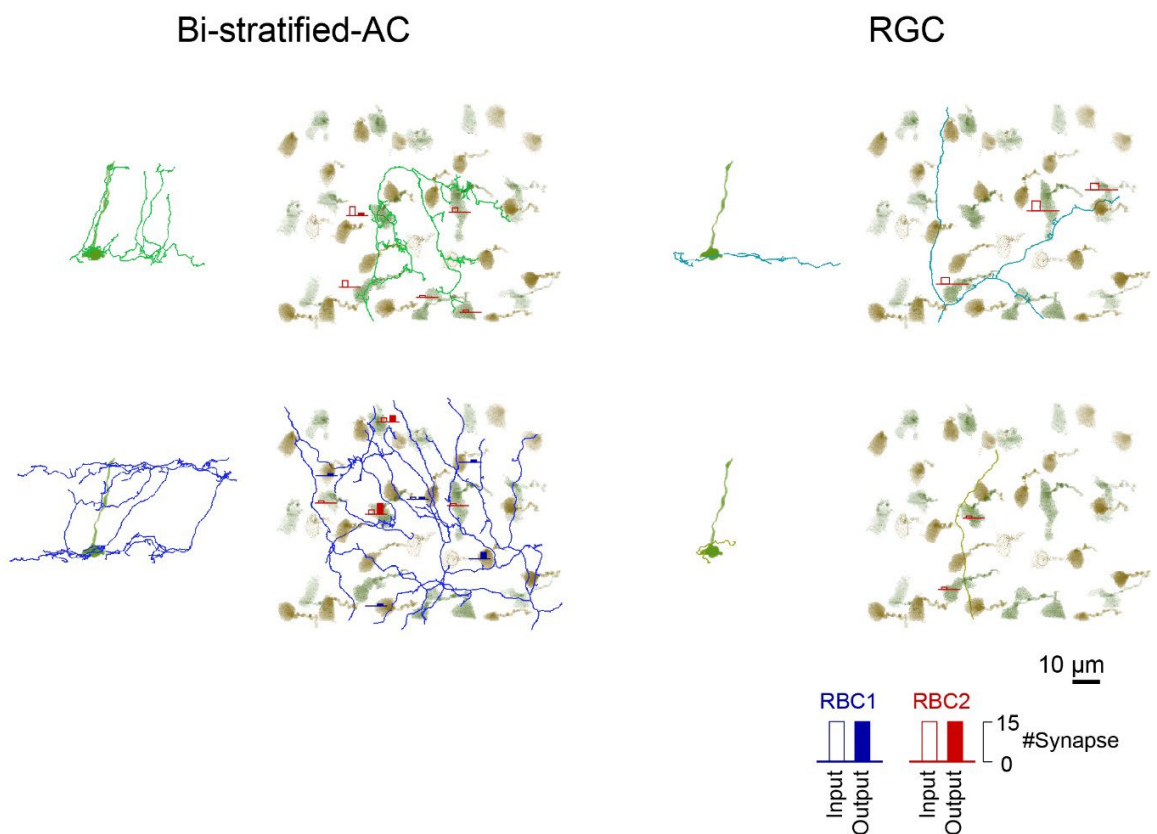## Monostratifying-AC without reciprocal synapses

773

774 **Figure S8. Gallery of mono-stratifying AC connected to RBC2**

775 *En face* and side views of individual cells. The numbers of input (open bar) and output (closed

776 bar) synapses with each RBC1 (blue) and RBC2 (red) terminal are indicated as the height of the

777 bars.

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Figure S9

779

780 **Figure S9. Gallery of bi-stratifying AC and RGC connected to RBC2**

781 *En face* and side views of individual cells. The numbers of input (open bar) and output (closed

782 bar) synapses with each RBC1 (blue) and RBC2 (red) terminal are indicated as the height of the

783 bars.