Velocity of nymph development

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Data import

Background information

As discussed with Huub Hoefsloot and Marc Galland, I will try to calculate the velocity of nymph development per stage. This is the change in number of nymphs per x amount of time. For the amount of time I will start with two days, because I counted once per two days. The calculations are as follows:

$$\Delta 1^{st} = +1^{st} - +2^{nd}$$
$$\Delta 2^{nd} = +2^{nd} - +3^{rd}$$
$$\Delta 3^{rd} = +3^{rd} - +4^{th}$$
$$\Delta 4^{th} = +4^{th}$$

For more information on the data, see 'data_exploration.pdf'.

The raw data

genotype	place	date	day	stage	number	eggs_start	hatched
LA1840	1	26/11/2021	2	0_egg	60	60	40
LA1840	1	26/11/2021	2	1_first_instar	0	60	40
LA1840	1	26/11/2021	2	2_second_instar	0	60	40
LA1840	1	26/11/2021	2	3_third_instar	0	60	40
LA1840	1	26/11/2021	2	4_early_fourth_instar	0	60	40
LA1840	1	26/11/2021	2	5_late_fourth_instar	0	60	40
LA1840	1	26/11/2021	2	6_exuviea	0	60	40
MM	2	26/11/2021	2	0_egg	66	66	46
MM	2	26/11/2021	2	1_first_instar	0	66	46
MM	2	26/11/2021	2	2_second_instar	0	66	46

Velocity

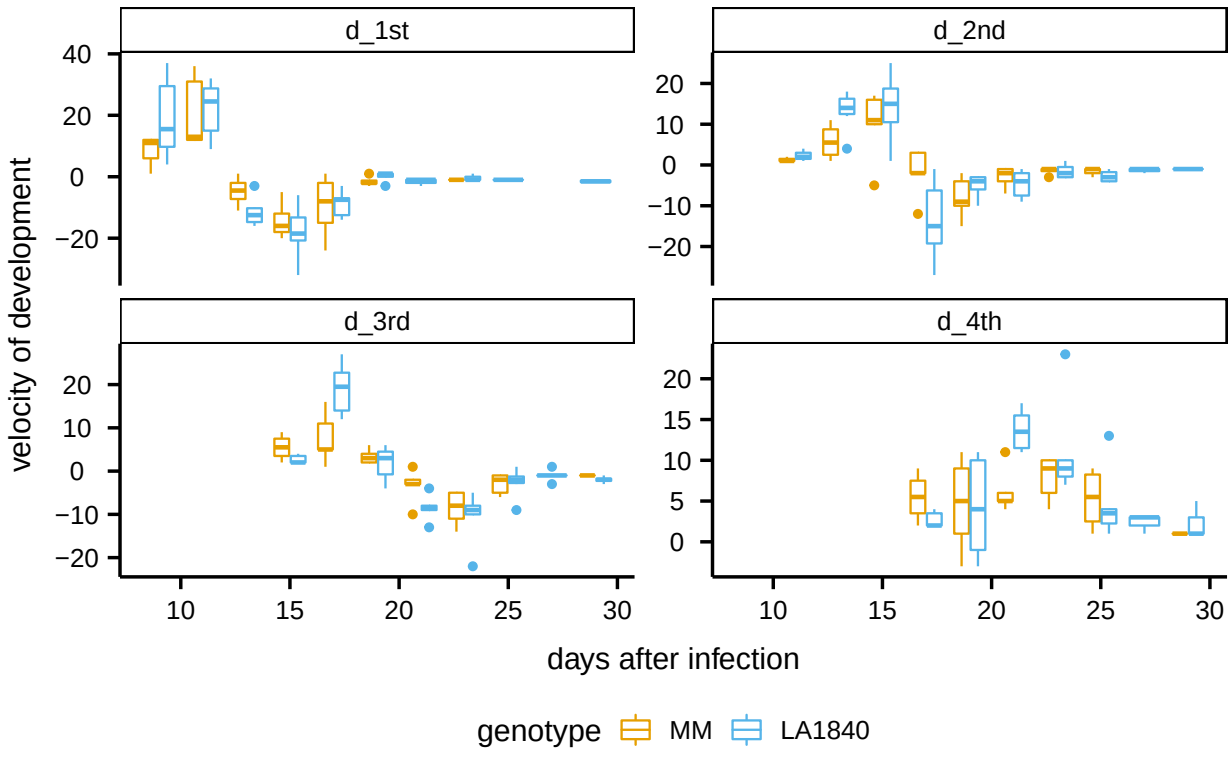
I'm wondering if I would get the same result if I do

$$\Delta 1^{st} = 1_t^{st} - 1_t^{st} - 1$$
$$\Delta 2^{nd} = 2_t^{nd} - 2_t^{nd} - 1$$
$$\Delta 3^{rd} = 3_t^{rd} - 3_t^{rd} - 1$$
$$\Delta 4^{th} = 4_t^{th} - 4_t^{th} - 1$$

Let's try with the absolute counts.

Table 2: An example from 1 plant

genotype	place	date	day	eggs_start	hatched	stage	velocity
LA1840	1	03/12/2021	9	60	40	d_1st	4
LA1840	1	03/12/2021	9	60	40	d_2nd	0
LA1840	1	03/12/2021	9	60	40	d_3rd	0
LA1840	1	03/12/2021	9	60	40	d_4th	0
LA1840	1	05/12/2021	11	60	40	d_1st	32
LA1840	1	05/12/2021	11	60	40	d_2nd	0
LA1840	1	05/12/2021	11	60	40	d_3rd	0
LA1840	1	05/12/2021	11	60	40	d_4th	0
LA1840	1	07/12/2021	13	60	40	d_1st	-3
LA1840	1	07/12/2021	13	60	40	d_2nd	4
LA1840	1	07/12/2021	13	60	40	d_3rd	0
LA1840	1	07/12/2021	13	60	40	d_4th	0



Behind the y-label should be: $(\frac{\Delta instar}{2days})$, but i don't know how to do that.

I now realize that this just shows the derivative of the counting data and is't much more informative. If the nymphs are stuck in some stage of development the velocity goes to 0, similar to when they have moved on.

I don't know if I did everything right, but I don't think this gives a clearer picture of the development.

For now I don't know if and how to continue with this.