

Pham 195707

1: Euratis_12	1	16	38	41	42	45	49	63	75	79	85	94	106	109	111	121	136	147	154	165	174	183	188	192	193	209	213	223	230	251	258	266	275	285	302		
2: phiBT1_43	1	16	30	38	41	45	54	63	75	79	85	94	100	106	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	303	
3: TG1_12	1	16	41	42	45	54	63	75	79	85	94	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302		
4: Samora_12	1	16	30	38	41	45	54	63	75	79	85	94	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302	
5: Lilbooboo_12	1	16	30	38	41	45	54	63	75	79	85	94	99	106	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302	
6: Vash_12	1	16	38	41	42	45	54	63	74	79	85	94	99	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302
7: Shawty_12	1	16	30	38	41	45	54	63	74	79	85	94	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302	
8: RemusLookin_12	1	16	30	38	41	45	54	63	75	79	85	94	100	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302
9: Heather_12	1	16	30	38	41	45	54	63	74	79	85	94	106	109	111	121	136	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	302	
10: Sebastiana_12	1	16	30	38	41	46	54	63	72	81	89	94	98	106	109	117	138	148	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
11: Solo_16	1	16	30	38	41	50	57	66	75	79	88	94	98	106	110	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
12: SV1_16	1	16	30	38	41	50	57	66	74	88	90	94	98	106	111	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
13: Raleigh_16	1	16	30	38	41	50	57	66	75	79	88	94	98	106	110	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
14: PapayaSalad_16	1	16	30	38	41	50	57	66	75	79	88	94	98	106	110	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
15: IdiSumtinwong_16	1	16	30	38	41	50	57	66	75	79	88	94	98	106	110	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
16: Austrorattus_16	1	16	30	38	41	46	54	63	71	81	94	97	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305		
17: Keahu_21	1	16	30	38	41	46	54	63	71	81	87	94	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305		
18: Hiyaa_21	1	16	30	38	41	46	54	63	71	81	87	94	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305		
19: Spouter_21	1	16	30	38	41	46	53	64	71	81	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305		
20: Galactica_19	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
21: Antuna_21+1	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
22: Dropshot_21+	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
23: Phoneging_21	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
24: Blett_22	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
25: Bush_22	1	16	30	38	40	43	53	64	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	305	
26: Warren_21	1	16	30	38	40	43	53	64	74	82	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	307	310
27: Pickles13_21	1	16	30	38	40	43	53	63	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	307	310
28: Teng_22	1	16	30	38	40	43	53	63	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	307	310
29: DelaGarza_20	1	16	30	38	40	43	53	63	74	84	90	94	98	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	307	310
30: Lesiram_21	1	16	30	38	40	43	53	63	74	84	90	94	98	101	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	306
31: Gingerbug_18	1	16	30	38	40	43	53	63	74	84	90	94	98	101	106	109	117	128	147	154	165	174	183	188	192	193	204	208	217	223	230	251	258	266	275	285	306

Note: Tracks are now grouped by subcluster and scaled. Switching in subcluster is indicated by changes in track color. Track scale is now set by default to display the region 30 bp upstream of start 1 to 30 bp downstream of the last possible start. If this default region is judged to be packed too tightly with annotated starts, the track will be further scaled to only show that region of the ORF with annotated starts. This action will be indicated by adding "Zoomed" to the title. For starts, yellow indicates the location of called starts comprised solely of Glimmer/GeneMark auto-annotations, green indicates the location of called starts with at least 1 manual gene annotation.

## Pham 195707 Report

This analysis was run 12/09/24 on database version 580.

WARNING: Pham size does not match number of genes in report. Either unphamerated genes have been added (by you) or starterator has removed genes due to invalid start codon.

Pham number 195707 has 34 members, 2 are drafts.

Phages represented in each track:

- Track 1 : Euratis\_12
- Track 2 : phiBT1\_43
- Track 3 : TG1\_12
- Track 4 : Samora\_12
- Track 5 : Lilbooboo\_12
- Track 6 : Vash\_12
- Track 7 : Shawty\_12
- Track 8 : RemusLoopin\_12
- Track 9 : Heather\_12
- Track 10 : Sebastisaurus\_12
- Track 11 : SoJo\_16
- Track 12 : SV1\_16
- Track 13 : Raleigh\_16
- Track 14 : PapayaSalad\_16
- Track 15 : Ididsumtinwong\_16, Bioscum\_16
- Track 16 : Austintatious\_16
- Track 17 : Keanu\_21
- Track 18 : Hiyaa\_21
- Track 19 : Spocter\_21
- Track 20 : Galactica\_19
- Track 21 : Antuna\_22, MenE\_22
- Track 22 : Dropshot\_21, Appa\_21
- Track 23 : Phonegingi\_21
- Track 24 : Blett\_22
- Track 25 : Bush\_22
- Track 26 : Warren\_22
- Track 27 : Pickles13\_21
- Track 28 : Teng\_22
- Track 29 : DelaGarza\_20
- Track 30 : Lesiram\_21
- Track 31 : Gingerbug\_18

### **Summary of Final Annotations (See graph section above for start numbers):**

The start number called the most often in the published annotations is 12, it was called in 12 of the 32 non-draft genes in the pham.

Genes that call this "Most Annotated" start:

- Antuna\_22, Appa\_21, Blett\_22, Bush\_22, DelaGarza\_20, Dropshot\_21, Gingerbug\_18, Lesiram\_21, MenE\_22, Phonegingi\_21, Pickles13\_21, Teng\_22, Warren\_22,

Genes that have the "Most Annotated" start but do not call it:

- 

Genes that do not have the "Most Annotated" start:

- Austintatious\_16, Bioscum\_16, Euratis\_12, Galactica\_19, Heather\_12, Hiyaa\_21, Ididsumtinwong\_16, Keanu\_21, Lilbooboo\_12, PapayaSalad\_16, Raleigh\_16, RemusLoopin\_12, SV1\_16, Samora\_12, Sebastisaurus\_12, Shawty\_12, SoJo\_16, Spocter\_21, TG1\_12, Vash\_12, phiBT1\_43,

### **Summary by start number:**

Start 2:

- Found in 4 of 34 ( 11.8% ) of genes in pham
- Manual Annotations of this start: 4 of 32
- Called 100.0% of time when present
- Phage (with cluster) where this start called: Galactica\_19 (BQ), Hiyaa\_21 (BQ), Keanu\_21 (BQ), Spocter\_21 (BQ),

Start 3:

- Found in 7 of 34 ( 20.6% ) of genes in pham
- Manual Annotations of this start: 7 of 32
- Called 100.0% of time when present
- Phage (with cluster) where this start called: Austintatious\_16 (BC3), Bioscum\_16 (BC3), Ididsumtinwong\_16 (BC3), PapayaSalad\_16 (BC3), Raleigh\_16 (BC2), SV1\_16 (BC1), SoJo\_16 (BC1),

Start 11:

- Found in 10 of 34 ( 29.4% ) of genes in pham
- Manual Annotations of this start: 9 of 32
- Called 100.0% of time when present
- Phage (with cluster) where this start called: Euratis\_12 (BB1), Heather\_12 (BB2), Lilbooboo\_12 (BB1), RemusLoopin\_12 (BB2), Samora\_12 (BB1), Sebastisaurus\_12 (BB2), Shawty\_12 (BB1), TG1\_12 (BB1), Vash\_12 (BB1), phiBT1\_43 (BB1),

Start 12:

- Found in 13 of 34 ( 38.2% ) of genes in pham
- Manual Annotations of this start: 12 of 32
- Called 100.0% of time when present
- Phage (with cluster) where this start called: Antuna\_22 (GA), Appa\_21 (GA), Blett\_22 (GA), Bush\_22 (GA), DelaGarza\_20 (GF), Dropshot\_21 (GA), Gingerbug\_18 (GF), Lesiram\_21 (GF), MenE\_22 (GA), Phonegingi\_21 (GA), Pickles13\_21 (GA), Teng\_22 (GF), Warren\_22 (GA),

## Summary by clusters:

There are 8 clusters represented in this pham: BQ, BC1, GF, BB1, GA, BB2, BC2, BC3,

Info for manual annotations of cluster BB1:

- Start number 11 was manually annotated 6 times for cluster BB1.

Info for manual annotations of cluster BB2:

- Start number 11 was manually annotated 3 times for cluster BB2.

Info for manual annotations of cluster BC1:

- Start number 3 was manually annotated 2 times for cluster BC1.

Info for manual annotations of cluster BC2:

- Start number 3 was manually annotated 1 time for cluster BC2.

Info for manual annotations of cluster BC3:

- Start number 3 was manually annotated 4 times for cluster BC3.

Info for manual annotations of cluster BQ:

- Start number 2 was manually annotated 4 times for cluster BQ.

Info for manual annotations of cluster GA:

- Start number 12 was manually annotated 9 times for cluster GA.

Info for manual annotations of cluster GF:

- Start number 12 was manually annotated 3 times for cluster GF.

## Gene Information:

Gene: Antuna\_22 Start: 11505, Stop: 13703, Start Num: 12

Candidate Starts for Antuna\_22:

(Start: 12 @11505 has 12 MA's), (20, 11580), (25, 11631), (28, 11658), (40, 11751), (43, 11808), (48, 11850), (51, 11883), (53, 11895), (60, 11946), (61, 11949), (63, 11958), (64, 11961), (66, 11997), (67, 12003), (68, 12006), (70, 12018), (72, 12027), (74, 12051), (84, 12150), (90, 12210), (93, 12249), (94, 12264), (98, 12321), (107, 12459), (109, 12489), (111, 12501), (113, 12525), (115, 12534), (119, 12555), (120, 12558), (123, 12570), (127, 12588), (135, 12630), (139, 12660), (163, 12801), (172, 12858), (187, 12924), (197, 12984), (199, 12993), (211, 13056), (221, 13122), (288, 13473), (291, 13497), (299, 13536), (301, 13557),

Gene: Appa\_21 Start: 11367, Stop: 13565, Start Num: 12

Candidate Starts for Appa\_21:

(Start: 12 @11367 has 12 MA's), (20, 11442), (25, 11493), (28, 11520), (40, 11613), (43, 11670), (48, 11712), (51, 11745), (53, 11757), (60, 11808), (61, 11811), (63, 11820), (64, 11823), (66, 11859), (67, 11865), (68, 11868), (70, 11880), (72, 11889), (74, 11913), (84, 12012), (90, 12072), (93, 12111), (94, 12126), (98, 12183), (107, 12321), (109, 12351), (111, 12363), (113, 12387), (115, 12396), (119, 12417), (120, 12420), (123, 12432), (127, 12450), (135, 12492), (139, 12522), (163, 12663), (172, 12720), (187, 12786), (197, 12846), (199, 12855), (211, 12918), (221, 12984), (233, 13017), (288, 13335), (291, 13359), (299, 13398), (301, 13419),

Gene: Austintatious\_16 Start: 9780, Stop: 12197, Start Num: 3

Candidate Starts for Austintatious\_16:

(Start: 3 @9780 has 7 MA's), (5, 9792), (8, 9846), (9, 9867), (29, 10041), (32, 10062), (39, 10119), (41, 10152), (50, 10254), (57, 10296), (63, 10338), (64, 10341), (65, 10353), (75, 10431), (79, 10494), (86, 10557), (88, 10575), (90, 10587), (94, 10641), (95, 10650), (97, 10695), (98, 10698), (105, 10779), (110, 10866), (111, 10869), (117, 10917), (122, 10935), (126, 10953), (128, 10965), (147, 11076), (154, 11133), (161, 11169), (165, 11190), (170, 11223), (171, 11229), (177, 11262), (183, 11283), (188, 11316), (192, 11340), (220, 11538), (258, 11796), (260, 11817), (265, 11841), (268, 11862), (278, 11916), (287, 11982), (289, 11994), (295, 12039),

Gene: Bioscum\_16 Start: 9816, Stop: 12233, Start Num: 3

Candidate Starts for Bioscum\_16:

(Start: 3 @9816 has 7 MA's), (5, 9828), (8, 9882), (9, 9903), (29, 10077), (32, 10098), (39, 10155), (41, 10188), (50, 10290), (57, 10332), (63, 10374), (64, 10377), (65, 10389), (75, 10467), (79, 10530), (86, 10593), (88, 10611), (90, 10623), (94, 10677), (95, 10686), (97, 10731), (98, 10734), (105, 10815), (110, 10902), (111, 10905), (117, 10953), (122, 10971), (126, 10989), (128, 11001), (147, 11112), (154, 11169), (161, 11205), (165, 11226), (170, 11259), (171, 11265), (183, 11319), (188, 11352), (192, 11376), (220, 11574), (258, 11832), (260, 11853), (265, 11877), (268, 11898), (278, 11952), (287, 12018), (289, 12030), (295, 12075),

Gene: Blett\_22 Start: 11520, Stop: 13718, Start Num: 12

Candidate Starts for Blett\_22:

(Start: 12 @11520 has 12 MA's), (20, 11595), (25, 11646), (28, 11673), (40, 11766), (43, 11823), (48, 11865), (51, 11898), (53, 11910), (60, 11961), (61, 11964), (63, 11973), (64, 11976), (66, 12012), (67, 12018), (68, 12021), (70, 12033), (72, 12042), (74, 12066), (84, 12165), (90, 12225), (93, 12264), (94, 12279), (98, 12336), (107, 12474), (109, 12504), (111, 12516), (113, 12540), (115, 12549), (119, 12570), (120, 12573), (123, 12585), (127, 12603), (135, 12645), (139, 12675), (160, 12804), (172, 12873), (187, 12939), (197, 12999), (199, 13008), (211, 13071), (221, 13137), (233, 13170), (288, 13488), (291, 13512), (299, 13551), (301, 13572),

Gene: Bush\_22 Start: 11501, Stop: 13699, Start Num: 12

Candidate Starts for Bush\_22:

(Start: 12 @11501 has 12 MA's), (20, 11576), (25, 11627), (28, 11654), (40, 11747), (43, 11804), (48, 11846), (51, 11879), (53, 11891), (60, 11942), (61, 11945), (63, 11954), (64, 11957), (66, 11993), (67, 11999), (68, 12002), (70, 12014), (72, 12023), (74, 12047), (84, 12146), (90, 12206), (93, 12245), (94, 12260), (104, 12398), (105, 12404), (107, 12455), (109, 12485), (111, 12497), (113, 12521), (115, 12530), (119, 12551), (120, 12554), (123, 12566), (127, 12584), (135, 12626), (139, 12656), (163, 12797), (172, 12854), (187, 12920), (197, 12980), (199, 12989), (211, 13052), (221, 13118), (233, 13151), (288, 13469), (291, 13493), (299, 13532), (301, 13553),

Gene: DelaGarza\_20 Start: 12031, Stop: 14265, Start Num: 12

Candidate Starts for DelaGarza\_20:

(Start: 12 @12031 has 12 MA's), (14, 12037), (21, 12118), (23, 12130), (25, 12148), (26, 12157), (32, 12199), (33, 12205), (48, 12367), (49, 12382), (52, 12403), (53, 12412), (63, 12475), (73, 12556), (74, 12568), (78, 12616), (79, 12634), (84, 12667), (90, 12727), (94, 12781), (98, 12838), (107, 12976), (109, 13006), (111, 13018), (116, 13063), (132, 13132), (139, 13171), (144, 13195), (151, 13216), (162, 13282), (182, 13372), (185, 13381), (186, 13384), (194, 13435), (215, 13579), (225, 13675), (231, 13711), (235, 13732), (240, 13783), (243, 13798), (269, 13963), (270, 13972), (281, 14008), (288, 14065), (291, 14083), (294, 14098), (297, 14107),

Gene: Dropshot\_21 Start: 11367, Stop: 13565, Start Num: 12

Candidate Starts for Dropshot\_21:

(Start: 12 @11367 has 12 MA's), (20, 11442), (25, 11493), (28, 11520), (40, 11613), (43, 11670), (48, 11712), (51, 11745), (53, 11757), (60, 11808), (61, 11811), (63, 11820), (64, 11823), (66, 11859), (67, 11865), (68, 11868), (70, 11880), (72, 11889), (74, 11913), (84, 12012), (90, 12072), (93, 12111), (94, 12126), (98, 12183), (107, 12321), (109, 12351), (111, 12363), (113, 12387), (115, 12396), (119, 12417), (120, 12420), (123, 12432), (127, 12450), (135, 12492), (139, 12522), (163, 12663), (172, 12720), (187, 12786), (197, 12846), (199, 12855), (211, 12918), (221, 12984), (233, 13017), (288, 13335), (291, 13359), (299, 13398), (301, 13419),

Gene: Euratis\_12 Start: 8185, Stop: 10374, Start Num: 11

Candidate Starts for Euratis\_12:

(Start: 11 @8185 has 9 MA's), (16, 8212), (19, 8242), (38, 8392), (41, 8443), (42, 8470), (47, 8518), (50, 8545), (54, 8569), (62, 8626), (63, 8629), (65, 8644), (75, 8722), (79, 8785), (85, 8836), (92, 8911), (94, 8932), (105, 9070), (108, 9127), (111, 9160), (121, 9220), (136, 9295), (145, 9355), (147, 9367), (154, 9424), (156, 9430), (157, 9439), (161, 9460), (165, 9481), (175, 9538), (180, 9568), (183, 9574), (184, 9589), (188, 9607), (192, 9631), (197, 9664), (199, 9673), (201, 9679), (203, 9685), (209, 9748), (213, 9778), (223, 9862), (228, 9895), (230, 9907), (251, 10048), (258, 10081), (259, 10093), (266, 10132), (275, 10177), (283, 10231), (285, 10255), (302, 10342),

Gene: Galactica\_19 Start: 14849, Stop: 17671, Start Num: 2

Candidate Starts for Galactica\_19:

(Start: 2 @14849 has 4 MA's), (6, 14936), (7, 14957), (24, 15179), (29, 15212), (31, 15221), (46, 15383), (53, 15446), (64, 15512), (66, 15548), (71, 15575), (72, 15578), (77, 15641), (81, 15674), (94, 15812), (99, 15878), (105, 15950), (107, 15998), (109, 16028), (114, 16070), (121, 16100), (123, 16109), (125, 16121), (128, 16136), (133, 16163), (145, 16235), (148, 16250), (161, 16340), (165, 16361), (168, 16376), (177, 16433), (183, 16454), (184, 16469), (188, 16487), (192, 16511), (206, 16598), (210, 16637), (230, 16787), (241, 16862), (245, 16883), (250, 16916), (258, 16961), (260, 16982), (267, 17015), (272, 17048), (276, 17063), (284, 17117), (285, 17138), (290, 17159), (293, 17183), (297, 17207), (304, 17258), (306, 17270), (309, 17291), (311, 17453), (312, 17498), (313, 17555), (314, 17579),

Gene: Gingerbug\_18 Start: 11192, Stop: 13474, Start Num: 12

Candidate Starts for Gingerbug\_18:

(Start: 12 @11192 has 12 MA's), (21, 11273), (23, 11285), (38, 11393), (42, 11471), (43, 11480), (45, 11501), (48, 11522), (49, 11537), (52, 11558), (63, 11630), (65, 11645), (73, 11711), (75, 11726), (76, 11735), (78, 11771), (79, 11789), (84, 11822), (90, 11882), (94, 11936), (97, 11990), (101, 12023), (105, 12080), (108, 12140), (109, 12161), (111, 12173), (112, 12185), (118, 12224), (120, 12230), (124, 12251), (127, 12260), (135, 12302), (137, 12314), (139, 12332), (153, 12428), (158, 12449), (163, 12473), (164, 12476), (167, 12497), (173, 12533), (187, 12596), (191, 12620), (210, 12752), (211, 12761), (225, 12884), (231, 12920), (238, 12983), (247, 13034), (249, 13046), (256, 13091), (271, 13190), (281, 13217), (294, 13307), (306, 13376),

Gene: Heather\_12 Start: 8215, Stop: 10404, Start Num: 11

Candidate Starts for Heather\_12:

(Start: 11 @8215 has 9 MA's), (30, 8365), (32, 8383), (38, 8422), (41, 8473), (42, 8500), (50, 8575), (54, 8599), (63, 8659), (75, 8752), (79, 8815), (85, 8866), (86, 8878), (94, 8962), (100, 9037), (102, 9070), (105, 9100), (108, 9157), (111, 9190), (176, 9580), (183, 9604), (188, 9637), (192, 9661), (197, 9694), (200, 9706), (230, 9937), (246, 10045), (251, 10078), (258, 10111), (275, 10207), (279, 10228), (292, 10324),

Gene: Hiyaa\_21 Start: 15882, Stop: 18707, Start Num: 2

Candidate Starts for Hiyaa\_21:

(1, 15810), (Start: 2 @15882 has 4 MA's), (6, 15969), (7, 15990), (24, 16212), (29, 16245), (41, 16356), (46, 16416), (64, 16545), (66, 16581), (67, 16587), (70, 16602), (72, 16611), (77, 16674), (81,

16707), (87, 16773), (94, 16845), (105, 16983), (109, 17061), (114, 17103), (117, 17121), (122, 17139), (123, 17142), (128, 17169), (129, 17175), (133, 17196), (140, 17247), (145, 17268), (151, 17304), (161, 17373), (166, 17400), (177, 17466), (183, 17487), (184, 17502), (188, 17520), (190, 17535), (192, 17544), (196, 17574), (208, 17649), (214, 17697), (217, 17718), (223, 17775), (224, 17778), (230, 17820), (231, 17823), (239, 17883), (241, 17895), (245, 17916), (254, 17973), (258, 17994), (261, 18027), (274, 18084), (282, 18138), (285, 18171), (296, 18237), (304, 18291), (308, 18315), (314, 18615), (315, 18696),

Gene: Ididsumtinwong\_16 Start: 9816, Stop: 12233, Start Num: 3

Candidate Starts for Ididsumtinwong\_16:

(Start: 3 @9816 has 7 MA's), (5, 9828), (8, 9882), (9, 9903), (29, 10077), (32, 10098), (39, 10155), (41, 10188), (50, 10290), (57, 10332), (63, 10374), (64, 10377), (65, 10389), (75, 10467), (79, 10530), (86, 10593), (88, 10611), (90, 10623), (94, 10677), (95, 10686), (97, 10731), (98, 10734), (105, 10815), (110, 10902), (111, 10905), (117, 10953), (122, 10971), (126, 10989), (128, 11001), (147, 11112), (154, 11169), (161, 11205), (165, 11226), (170, 11259), (171, 11265), (183, 11319), (188, 11352), (192, 11376), (220, 11574), (258, 11832), (260, 11853), (265, 11877), (268, 11898), (278, 11952), (287, 12018), (289, 12030), (295, 12075),

Gene: Keanu\_21 Start: 15925, Stop: 18747, Start Num: 2

Candidate Starts for Keanu\_21:

(1, 15853), (Start: 2 @15925 has 4 MA's), (6, 16012), (7, 16033), (17, 16168), (24, 16255), (29, 16288), (31, 16297), (41, 16399), (46, 16459), (64, 16588), (66, 16624), (67, 16630), (68, 16633), (71, 16651), (72, 16654), (77, 16717), (81, 16750), (94, 16888), (97, 16942), (102, 16996), (105, 17026), (106, 17038), (109, 17104), (116, 17161), (117, 17164), (123, 17185), (128, 17212), (137, 17260), (149, 17338), (151, 17347), (166, 17443), (174, 17491), (177, 17509), (180, 17524), (181, 17527), (183, 17530), (184, 17545), (188, 17563), (192, 17587), (196, 17617), (208, 17692), (212, 17725), (214, 17740), (224, 17821), (226, 17839), (231, 17866), (236, 17893), (241, 17938), (246, 17971), (255, 18025), (258, 18037), (260, 18058), (261, 18070), (274, 18127), (284, 18193), (285, 18214), (296, 18280), (304, 18334), (306, 18346), (308, 18358),

Gene: Lesiram\_21 Start: 12001, Stop: 14235, Start Num: 12

Candidate Starts for Lesiram\_21:

(Start: 12 @12001 has 12 MA's), (14, 12007), (21, 12088), (23, 12100), (25, 12118), (26, 12127), (32, 12169), (33, 12175), (48, 12337), (49, 12352), (52, 12373), (53, 12382), (63, 12445), (73, 12526), (74, 12538), (78, 12586), (79, 12604), (84, 12637), (90, 12697), (94, 12751), (98, 12808), (107, 12946), (109, 12976), (111, 12988), (116, 13033), (132, 13102), (139, 13141), (144, 13165), (151, 13186), (162, 13252), (182, 13342), (186, 13354), (194, 13405), (203, 13438), (225, 13645), (231, 13681), (235, 13702), (240, 13753), (243, 13768), (269, 13933), (270, 13942), (281, 13978), (288, 14035), (291, 14053), (294, 14068), (297, 14077),

Gene: Lilbooboo\_12 Start: 8195, Stop: 10384, Start Num: 11

Candidate Starts for Lilbooboo\_12:

(Start: 11 @8195 has 9 MA's), (16, 8222), (18, 8240), (32, 8363), (38, 8402), (41, 8453), (47, 8528), (50, 8555), (54, 8579), (55, 8585), (62, 8636), (63, 8639), (65, 8654), (75, 8732), (79, 8795), (85, 8846), (89, 8879), (91, 8900), (92, 8921), (94, 8942), (105, 9080), (111, 9170), (120, 9227), (125, 9251), (127, 9260), (136, 9305), (138, 9326), (154, 9434), (161, 9470), (165, 9491), (181, 9581), (183, 9584), (188, 9617), (192, 9641), (198, 9680), (200, 9686), (217, 9815), (223, 9872), (228, 9905), (229, 9908), (232, 9926), (237, 9959), (258, 10091), (275, 10187), (283, 10241), (302, 10352),

Gene: MenE\_22 Start: 11635, Stop: 13833, Start Num: 12

Candidate Starts for MenE\_22:

(Start: 12 @11635 has 12 MA's), (20, 11710), (25, 11761), (28, 11788), (40, 11881), (43, 11938), (48, 11980), (51, 12013), (53, 12025), (60, 12076), (61, 12079), (63, 12088), (64, 12091), (66, 12127), (67,

12133), (68, 12136), (70, 12148), (72, 12157), (74, 12181), (84, 12280), (90, 12340), (93, 12379), (94, 12394), (98, 12451), (107, 12589), (109, 12619), (111, 12631), (113, 12655), (115, 12664), (119, 12685), (120, 12688), (123, 12700), (127, 12718), (135, 12760), (139, 12790), (163, 12931), (172, 12988), (187, 13054), (197, 13114), (199, 13123), (211, 13186), (221, 13252), (288, 13603), (291, 13627), (299, 13666), (301, 13687),

Gene: PapayaSalad\_16 Start: 9786, Stop: 12203, Start Num: 3

Candidate Starts for PapayaSalad\_16:

(Start: 3 @9786 has 7 MA's), (5, 9798), (8, 9852), (9, 9873), (29, 10047), (32, 10068), (39, 10125), (50, 10260), (57, 10302), (63, 10344), (64, 10347), (65, 10359), (75, 10437), (79, 10500), (86, 10563), (88, 10581), (90, 10593), (94, 10647), (95, 10656), (97, 10701), (98, 10704), (105, 10785), (110, 10872), (111, 10875), (117, 10923), (122, 10941), (126, 10959), (128, 10971), (147, 11082), (154, 11139), (161, 11175), (165, 11196), (170, 11229), (171, 11235), (177, 11268), (183, 11289), (188, 11322), (192, 11346), (205, 11421), (260, 11823), (265, 11847), (268, 11868), (278, 11922), (286, 11985), (289, 12000), (295, 12045),

Gene: Phonegingi\_21 Start: 11365, Stop: 13626, Start Num: 12

Candidate Starts for Phonegingi\_21:

(Start: 12 @11365 has 12 MA's), (20, 11440), (25, 11491), (28, 11518), (40, 11611), (44, 11680), (48, 11710), (51, 11743), (53, 11755), (60, 11806), (61, 11809), (63, 11818), (64, 11821), (66, 11857), (67, 11863), (68, 11866), (70, 11878), (72, 11887), (84, 12010), (90, 12070), (93, 12109), (94, 12124), (98, 12181), (105, 12268), (107, 12319), (109, 12349), (111, 12361), (113, 12385), (115, 12394), (116, 12406), (119, 12415), (120, 12418), (123, 12430), (134, 12487), (135, 12490), (139, 12520), (160, 12649), (172, 12718), (179, 12751), (187, 12784), (189, 12799), (197, 12844), (199, 12853), (216, 12943), (233, 13015), (243, 13063), (248, 13096), (256, 13147), (260, 13180), (263, 13213), (264, 13216), (271, 13291), (288, 13396), (291, 13420), (299, 13459),

Gene: Pickles13\_21 Start: 11528, Stop: 13990, Start Num: 12

Candidate Starts for Pickles13\_21:

(Start: 12 @11528 has 12 MA's), (20, 11603), (22, 11633), (27, 11666), (28, 11681), (38, 11744), (40, 11774), (41, 11795), (43, 11831), (48, 11873), (51, 11906), (53, 11918), (60, 11969), (61, 11972), (64, 11984), (66, 12020), (67, 12026), (68, 12029), (70, 12041), (72, 12050), (74, 12074), (82, 12152), (90, 12233), (93, 12272), (94, 12287), (96, 12299), (98, 12344), (100, 12362), (104, 12425), (105, 12431), (107, 12482), (109, 12512), (111, 12524), (113, 12548), (115, 12557), (119, 12578), (120, 12581), (123, 12593), (127, 12611), (129, 12623), (135, 12653), (141, 12701), (146, 12719), (158, 12800), (159, 12809), (164, 12827), (195, 13043), (202, 13076), (207, 13151), (218, 13253), (219, 13271), (221, 13322), (222, 13337), (227, 13385), (239, 13469), (257, 13577), (288, 13760), (291, 13784), (299, 13823), (300, 13838), (307, 13886), (310, 13964),

Gene: Raleigh\_16 Start: 10247, Stop: 12655, Start Num: 3

Candidate Starts for Raleigh\_16:

(Start: 3 @10247 has 7 MA's), (8, 10313), (9, 10334), (10, 10355), (13, 10412), (29, 10508), (35, 10544), (39, 10586), (51, 10730), (56, 10760), (57, 10763), (58, 10775), (59, 10784), (63, 10805), (66, 10844), (74, 10895), (79, 10961), (81, 10970), (83, 10982), (90, 11054), (94, 11108), (111, 11336), (117, 11384), (123, 11405), (169, 11675), (177, 11729), (178, 11732), (183, 11750), (184, 11765), (188, 11783), (192, 11807), (193, 11816), (196, 11837), (205, 11882), (210, 11933), (224, 12041), (244, 12176), (253, 12230), (256, 12251), (260, 12284), (268, 12329), (278, 12383), (289, 12464), (293, 12491), (298, 12515),

Gene: RemusLoopin\_12 Start: 8193, Stop: 10382, Start Num: 11

Candidate Starts for RemusLoopin\_12:

(Start: 11 @8193 has 9 MA's), (30, 8343), (32, 8361), (38, 8400), (41, 8451), (42, 8478), (50, 8553), (54, 8577), (63, 8637), (65, 8652), (74, 8727), (79, 8793), (85, 8844), (94, 8940), (102, 9048), (105,



9078), (111, 9168), (152, 9405), (154, 9432), (165, 9489), (175, 9546), (176, 9558), (183, 9582), (188, 9615), (192, 9639), (217, 9813), (230, 9915), (258, 10089), (275, 10185), (279, 10206), (294, 10311),

Gene: SV1\_16 Start: 10022, Stop: 12439, Start Num: 3

Candidate Starts for SV1\_16:

(Start: 3 @10022 has 7 MA's), (5, 10034), (8, 10088), (9, 10109), (29, 10283), (32, 10304), (38, 10343), (41, 10394), (50, 10496), (57, 10538), (62, 10577), (63, 10580), (64, 10583), (75, 10673), (79, 10736), (86, 10799), (88, 10817), (90, 10829), (94, 10883), (98, 10940), (105, 11021), (110, 11108), (111, 11111), (117, 11159), (122, 11177), (128, 11207), (165, 11432), (171, 11471), (174, 11486), (183, 11525), (188, 11558), (192, 11582), (210, 11708), (220, 11780), (252, 12002), (258, 12038), (260, 12059), (265, 12083), (268, 12104), (273, 12131), (277, 12155), (278, 12158), (286, 12221), (287, 12224), (289, 12236), (295, 12281),

Gene: Samora\_12 Start: 8227, Stop: 10419, Start Num: 11

Candidate Starts for Samora\_12:

(Start: 11 @8227 has 9 MA's), (16, 8254), (18, 8272), (41, 8485), (42, 8512), (47, 8560), (50, 8587), (54, 8611), (63, 8671), (64, 8674), (65, 8686), (75, 8764), (79, 8827), (85, 8878), (91, 8932), (92, 8953), (94, 8974), (102, 9082), (105, 9112), (111, 9202), (161, 9502), (183, 9616), (188, 9649), (192, 9673), (198, 9712), (200, 9718), (217, 9847), (223, 9904), (228, 9937), (258, 10123), (275, 10219), (283, 10273), (285, 10297),

Gene: Sebastisaurus\_12 Start: 8219, Stop: 10408, Start Num: 11

Candidate Starts for Sebastisaurus\_12:

(Start: 11 @8219 has 9 MA's), (30, 8369), (32, 8387), (38, 8426), (40, 8456), (41, 8477), (42, 8504), (50, 8579), (54, 8603), (63, 8663), (65, 8678), (74, 8753), (79, 8819), (94, 8966), (102, 9074), (105, 9104), (108, 9161), (111, 9194), (152, 9431), (154, 9458), (165, 9515), (175, 9572), (176, 9584), (183, 9608), (188, 9641), (192, 9665), (217, 9839), (228, 9929), (230, 9941), (246, 10049), (251, 10082), (258, 10115), (262, 10151), (275, 10211), (280, 10235), (292, 10328), (294, 10337),

Gene: Shawty\_12 Start: 8222, Stop: 10411, Start Num: 11

Candidate Starts for Shawty\_12:

(Start: 11 @8222 has 9 MA's), (16, 8249), (36, 8414), (38, 8429), (41, 8480), (42, 8507), (50, 8582), (54, 8606), (63, 8666), (65, 8681), (69, 8717), (74, 8756), (79, 8822), (85, 8873), (92, 8948), (94, 8969), (99, 9035), (103, 9083), (105, 9107), (108, 9164), (111, 9197), (136, 9332), (155, 9464), (157, 9476), (161, 9497), (180, 9605), (183, 9611), (184, 9626), (188, 9644), (192, 9668), (199, 9710), (203, 9722), (213, 9815), (217, 9842), (228, 9932), (251, 10085), (258, 10118), (275, 10214),

Gene: SoJo\_16 Start: 10050, Stop: 12278, Start Num: 3

Candidate Starts for SoJo\_16:

(Start: 3 @10050 has 7 MA's), (4, 10056), (5, 10062), (15, 10239), (18, 10260), (29, 10377), (41, 10488), (46, 10548), (63, 10674), (72, 10743), (81, 10839), (89, 10914), (94, 10977), (99, 11043), (105, 11115), (109, 11193), (117, 11253), (138, 11319), (148, 11373), (154, 11382), (188, 11427), (191, 11445), (192, 11451), (211, 11586), (224, 11685), (234, 11742), (242, 11808), (244, 11820), (260, 11928), (265, 11952), (278, 12027), (289, 12108), (298, 12159), (305, 12189),

Gene: Spocter\_21 Start: 15870, Stop: 18695, Start Num: 2

Candidate Starts for Spocter\_21:

(1, 15798), (Start: 2 @15870 has 4 MA's), (6, 15957), (7, 15978), (24, 16200), (29, 16233), (41, 16344), (46, 16404), (64, 16533), (66, 16569), (67, 16575), (70, 16590), (72, 16599), (77, 16662), (81, 16695), (87, 16761), (94, 16833), (105, 16971), (109, 17049), (114, 17091), (117, 17109), (122, 17127), (123, 17130), (128, 17157), (129, 17163), (133, 17184), (140, 17235), (145, 17256), (148, 17271), (149, 17283), (151, 17292), (161, 17361), (166, 17388), (177, 17454), (183, 17475), (184, 17490), (188, 17508), (190, 17523), (192, 17532), (196, 17562), (201, 17580), (208, 17637), (214,

17685), (217, 17706), (223, 17763), (224, 17766), (230, 17808), (231, 17811), (237, 17850), (239, 17871), (241, 17883), (245, 17904), (254, 17961), (258, 17982), (261, 18015), (274, 18072), (282, 18126), (285, 18159), (304, 18279), (308, 18303), (314, 18603), (315, 18684),

Gene: TG1\_12 Start: 8190, Stop: 10379, Start Num: 11

Candidate Starts for TG1\_12:

(Start: 11 @8190 has 9 MA's), (16, 8217), (30, 8340), (34, 8370), (37, 8385), (38, 8397), (41, 8448), (54, 8574), (63, 8634), (75, 8727), (79, 8790), (80, 8796), (91, 8895), (94, 8937), (100, 9012), (102, 9045), (105, 9075), (111, 9165), (130, 9276), (131, 9279), (136, 9300), (142, 9348), (157, 9444), (170, 9519), (174, 9540), (183, 9579), (184, 9594), (188, 9612), (190, 9627), (192, 9636), (204, 9693), (208, 9741), (230, 9912), (236, 9942), (237, 9954), (258, 10086), (259, 10098), (275, 10182), (286, 10263), (291, 10299), (303, 10362),

Gene: Teng\_22 Start: 12028, Stop: 14262, Start Num: 12

Candidate Starts for Teng\_22:

(Start: 12 @12028 has 12 MA's), (14, 12034), (21, 12115), (23, 12127), (25, 12145), (26, 12154), (32, 12196), (33, 12202), (48, 12364), (49, 12379), (52, 12400), (53, 12409), (63, 12472), (73, 12553), (74, 12565), (78, 12613), (79, 12631), (84, 12664), (90, 12724), (94, 12778), (98, 12835), (107, 12973), (109, 13003), (111, 13015), (132, 13129), (139, 13168), (144, 13192), (151, 13213), (162, 13279), (182, 13369), (186, 13381), (194, 13432), (231, 13708), (235, 13729), (240, 13780), (243, 13795), (269, 13960), (270, 13969), (281, 14005), (288, 14062), (291, 14080), (294, 14095), (297, 14104),

Gene: Vash\_12 Start: 8200, Stop: 10392, Start Num: 11

Candidate Starts for Vash\_12:

(Start: 11 @8200 has 9 MA's), (16, 8227), (32, 8368), (38, 8407), (41, 8458), (47, 8533), (50, 8560), (54, 8584), (55, 8590), (62, 8641), (63, 8644), (65, 8659), (75, 8737), (79, 8800), (85, 8851), (89, 8884), (92, 8926), (94, 8947), (99, 9013), (105, 9085), (111, 9175), (120, 9232), (127, 9265), (131, 9289), (136, 9310), (138, 9331), (154, 9439), (161, 9475), (176, 9565), (178, 9571), (181, 9586), (183, 9589), (188, 9622), (192, 9646), (198, 9685), (217, 9820), (223, 9877), (228, 9910), (230, 9922), (258, 10096), (275, 10192), (283, 10246), (285, 10270), (291, 10309), (293, 10315), (302, 10360),

Gene: Warren\_22 Start: 11565, Stop: 13763, Start Num: 12

Candidate Starts for Warren\_22:

(Start: 12 @11565 has 12 MA's), (20, 11640), (25, 11691), (28, 11718), (40, 11811), (48, 11910), (51, 11943), (53, 11955), (60, 12006), (61, 12009), (63, 12018), (64, 12021), (66, 12057), (67, 12063), (68, 12066), (70, 12078), (72, 12087), (74, 12111), (84, 12210), (90, 12270), (93, 12309), (94, 12324), (98, 12381), (107, 12519), (109, 12549), (111, 12561), (113, 12585), (115, 12594), (119, 12615), (120, 12618), (123, 12630), (127, 12648), (135, 12690), (139, 12720), (143, 12744), (160, 12849), (172, 12918), (179, 12951), (187, 12984), (197, 13044), (199, 13053), (211, 13116), (221, 13182), (233, 13215), (273, 13452), (288, 13533), (291, 13557), (299, 13596), (301, 13617),

Gene: phiBT1\_43 Start: 8225, Stop: 10414, Start Num: 11

Candidate Starts for phiBT1\_43:

(Start: 11 @8225 has 9 MA's), (16, 8252), (38, 8432), (41, 8483), (42, 8510), (47, 8558), (50, 8585), (54, 8609), (63, 8669), (65, 8684), (75, 8762), (79, 8825), (81, 8834), (85, 8876), (91, 8930), (92, 8951), (94, 8972), (102, 9080), (105, 9110), (111, 9200), (125, 9281), (130, 9311), (136, 9335), (138, 9356), (150, 9425), (152, 9437), (155, 9467), (157, 9479), (162, 9503), (177, 9593), (180, 9608), (183, 9614), (188, 9647), (190, 9662), (192, 9671), (198, 9710), (200, 9716), (203, 9725), (213, 9818), (223, 9902), (229, 9938), (230, 9947), (251, 10088), (258, 10121), (262, 10157), (275, 10217), (283, 10271), (284, 10277), (294, 10343),