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Improvement of the assembly of heterozygous genomes of non-model organisms

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► **To cite this version:**

Anaïs Gouin, Anthony Bretaudeau, Emmanuelle d'Alençon, Claire Lemaitre, Fabrice Legeai. Improvement of the assembly of heterozygous genomes of non-model organisms. *Genome Informatics*, Oct 2015, Cold Spring Harbor Laboratory, United States. 2015. hal-01231793

HAL Id: hal-01231793

<https://inria.hal.science/hal-01231793>

Submitted on 20 Nov 2015

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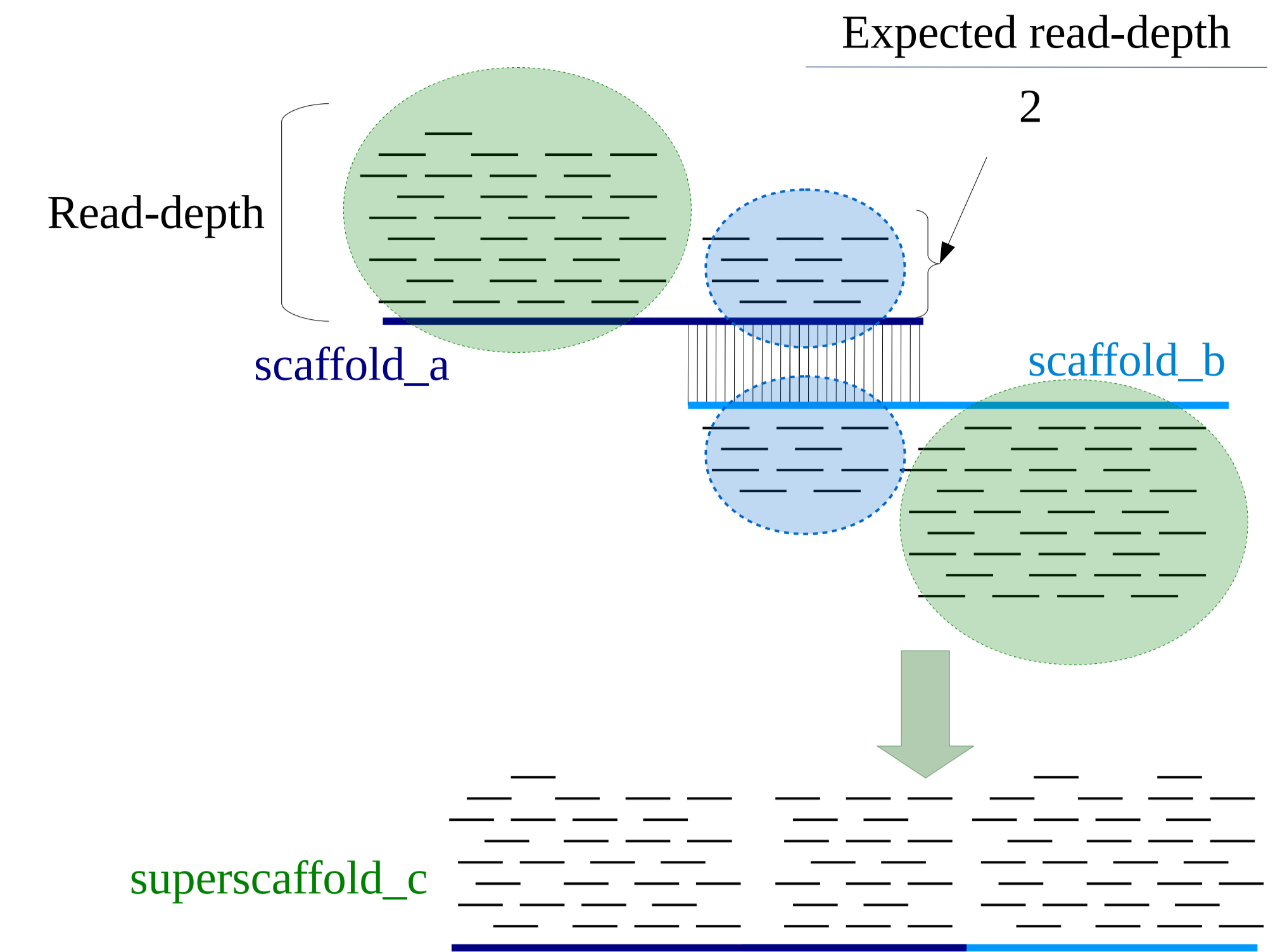
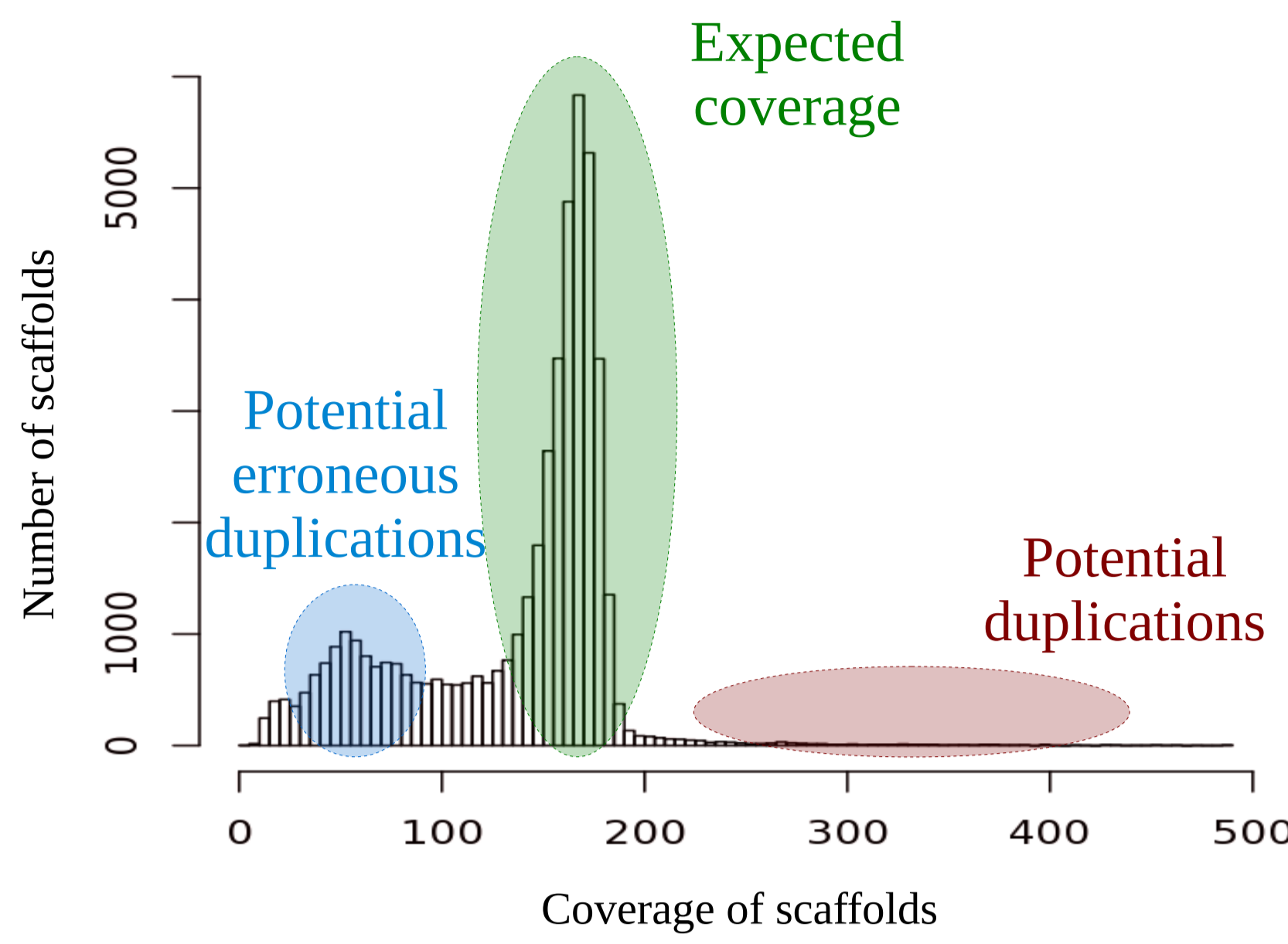
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Improvement of the assembly of heterozygous genomes of non-model organisms

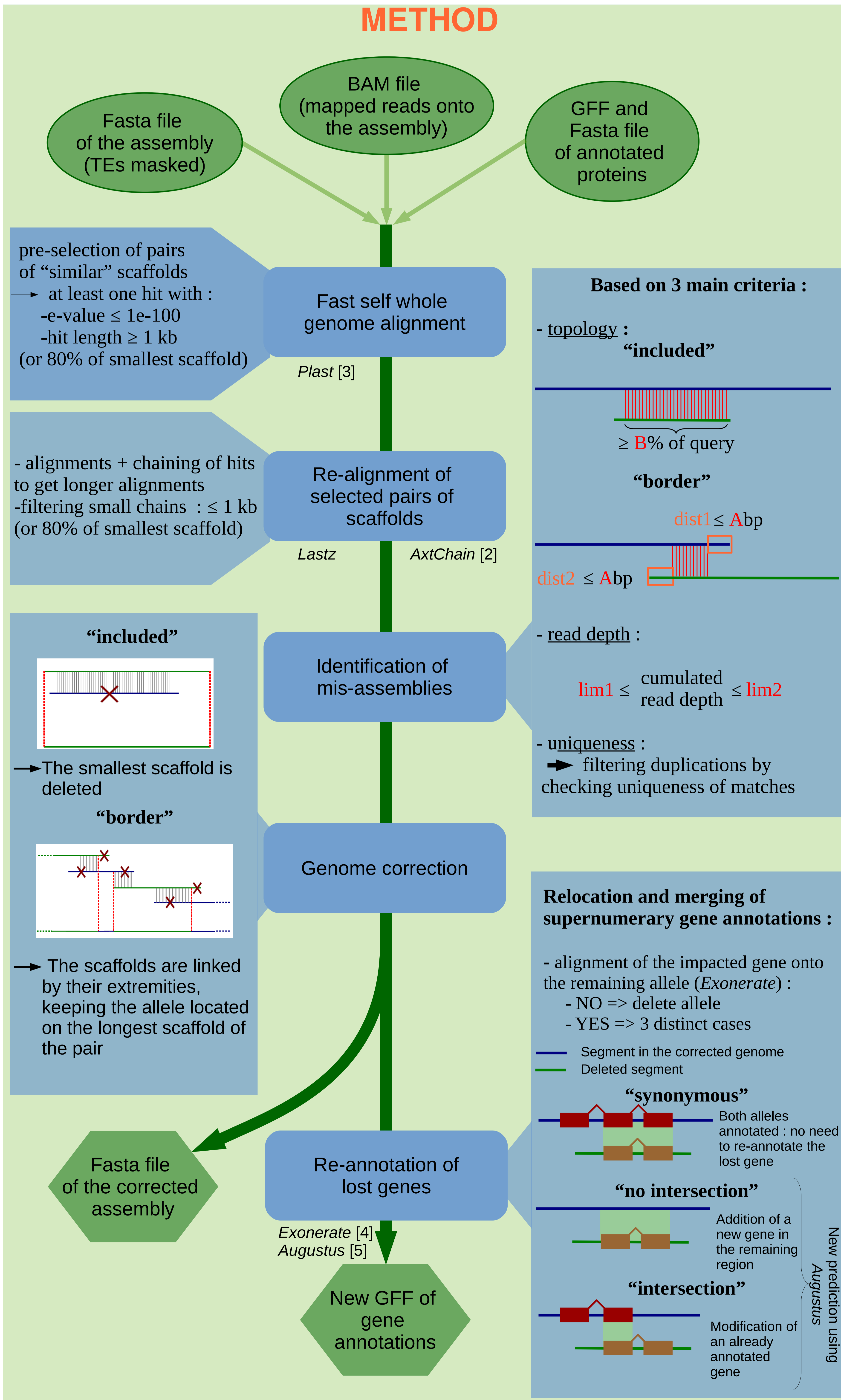
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Motivation : Some heterozygous regions have a significant divergence between the two haplotypes and the assembly process can lead to the construction of two different contigs, instead of one consensus sequence.

Objective : Set up a strategy to detect and correct false duplications in already-built assemblies.



METHOD



APPLICATION

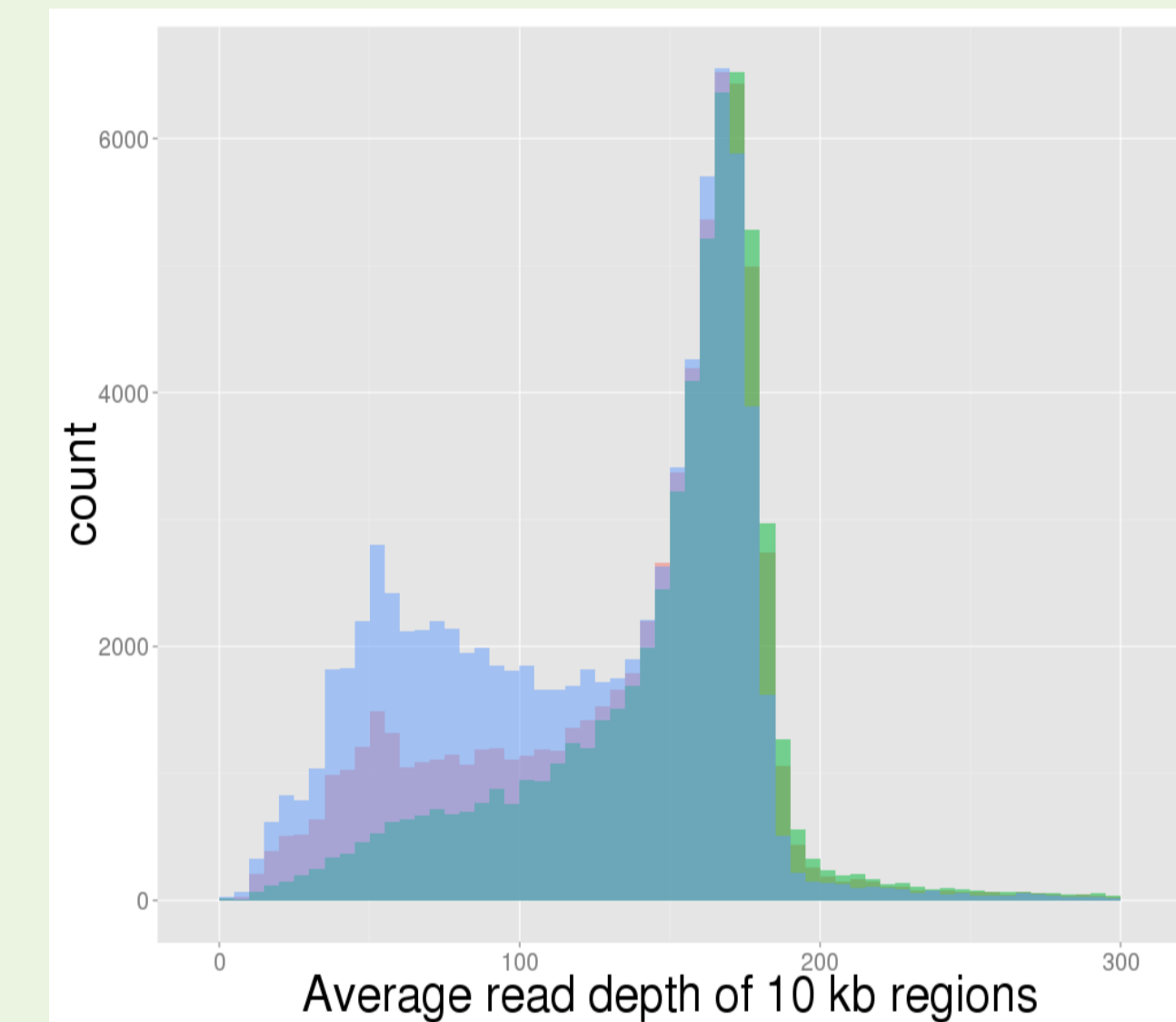
Spodoptera frugiperda genome

Genome correction

★ Comparison with another method : *Haplomerger* [1]
 Expected size : ~ 400 Mb

	Initial assembly <i>Allpaths</i>	Corrected assembly	<i>Haplomerger</i>
Total size (Mb)	526.0	434.9	369.5
Nb. scaffolds	48,272	41,577	37,797
N50 (kb)	39.6	52.8	58.4

★ Read depth analysis : before/after correction



- Improvement of the initial assembly for both methods
- Haplomerger* merged more regions, leading to a smaller final assembly

★ BUSCO statistics : Benchmarking sets of Universal Single-Copy Orthologs (2,675 for Arthropoda species) [6]

	Initial assembly	Corrected assembly	<i>Haplomerger</i>
Missing	363	336 *	562
Single copy	1,246	1,586 *	1,242
Fragmented	476	457 *	771
Duplicated	590	296	100 *

* best result by category

- Reduction of the genome size (17%), increase of the N50 and more single copies for important genes
- Reduces less than *Haplomerger* → gain of numerous BUSCO genes
- Our method: more conservative, preserves genome consistency and allows easier re-annotation of impacted genes

Annotation stats

Previous release : 25,041 genes
 ==> 3,746 genes to re-annotate

	# genes	% success
"no alignment"	34	0
"synonymous"	747	100
"no intersection"	643	45.4
"intersection"	2,322	86.3

==> Overall success of 80% / New release : 21,578 genes