



**Fig. 2: Asynchronous migration.** The figure illustrates asynchronous migration in `Propulate` using the example of two islands. Island 1 (blue) has  $N$  workers, island 2 (red) has  $M$  workers. Operations related to migration are shown in darker color tones. In each generation, a worker may dispatch migrants with the specified migration probability. We illustrate the migration process by tracing the interactions of worker  $N$  on island 1. After evaluation and intra-island synchronization (light blue boxes and arrows, see Fig. 1), this worker performs migration, i.e., it sends migrants to all workers of each target island, here represented by island 2. As emigrants must be removed from the source island's population, it also sends them to all co-workers within its own island to synchronize their population lists (middle blue arrow). The target island's workers receive the migrants asynchronously as soon as they are ready (dark blue arrows). Subsequently, worker  $N$  checks for and, if applicable, receives incoming migrants from island 2 to be included into its population. It then probes for individuals that have been emigrated by its co-workers in the meantime and need to be deactivated in its population list. After this migration-related intra-island synchronization, it breeds the next generation from its up-to-date population list. As migration does not occur in this generation, it directly checks for and receives migrants from island 2 before checking for emigrated individuals to be deactivated again. The other workers proceed similarly, where the detailed optimization progression depends on when they perform migration in addition to how long their evaluations take.