**Electronic Supplementary Material**

**Simulating public information quality as phenotypic divergence progresses.**To estimate the quality of information about resources provided by heterospecific flock mates relative to conspecific flock mates, we compared the expected difference in feeding rates among heterospecific flockmates to those for conspecific flockmates. We used the relationship between feeding performance and bill depth on lodgepole pine cones[27] and the bill depth distribution based on 2,501 Cassia crossbills centered under the performance peak to estimate the expected difference in feeding performance between two randomly drawn individuals. The more similar the feeding rates, the more informative the public information on patch quality[31]. This was repeated 1,000 times to provide an estimate of the expected difference in feeding performance between conspecifics. We then drew one individual from each of two bill depth distributions as the second bill depth distribution was shifted away from the distribution lying under the feeding performance peak in increments of 0.01 mm average bill depth difference. This was repeated 1,000 times for each increment to provide estimates of the expected differences between heterospecifics as a function of the difference in average bill depth as shown in figure S1. This analysis was done in R[51].

**The frequency of heterospecific learning**

A previous study in the South Hills found evidence of one ponderosa pine crossbill that changed its contact call to match those of its Cassia crossbill mate[32]. To estimate the frequency of such heterospecific learning, we examined the recordings of 844 individual crossbills that originally gave Cassia crossbill contact calls and were recorded in multiple years. Only three individuals categorically switched their calls over time (figure S2), all of which switched to giving ponderosa pine crossbill calls (the initial ascending element of the Cassia crossbill call was lost). We found no cases of call switching between Cassia crossbills and lodgepole pine crossbills, consistent with their greater divergence in call structure. The rarity of call switching in this system is consistent with the high levels of reproductive isolation and genomic divergence between Cassia and red crossbills[40,41]. Collectively, our results indicate that open-ended learning of calls has a net effect of promoting call divergence rather than call convergence.

**Estimating the timing of call divergence.**Assuming that prior to call divergence the correlation value between Cassia and ponderosa pine crossbills approximated the within species correlation value for Cassia crossbills (mean = 0.4717, range 0.005-0.986), then we can use the equation of *mean similarity* = 9.8248 - 0.0047\**year* to solve for the year when calls initially began to diverge (i.e., when call similarity would have equaled the within species correlation value). Setting *mean similarity* in the above equation to 0.472 gives the year 1990. Given that ponderosa pine crossbills were widespread in western North America in the 1980s[28] and likely well before, it is unlikely that call divergence began only since 1990. More likely, call divergence was initially very slow and only more recently accelerated as expected during trait divergence in response to maladaptive heterospecific interactions[53]. Interestingly, the rate of divergence in call similarity relative to ponderosa pine crossbills may be decreasing as Cassia crossbills become more divergent from ponderosa pine crossbill calls (the quadratic term in a second order polynomial fit to the data in figure 1B is positive [*P* = 0.14]), consistent with the expectation that the rate of such trait divergence is highest at intermediate levels of trait overlap[53].