Phoenix Rebirth Hampered: Regime Shift of Fire in Fynbos Ecosystem due to the Invasion of Acacias.

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Fynbos is natural woody plant vegetation situated in the floristic region in Western Cape, South Africa [2]. Most Fynbos depends on fire for seed production and germination and other survive fire by growing from the ground. Fire regime in Fynbos is possible to be changed by invasive alien plants, which in turn can be provoked by other changing global environmental factors such as rising ambient temperatures[2]. In particular, Australian Acacias is known to invade Fynbos ecosystem and change the fire regime. The fire regimes refer to how the fire varies, in terms of how often it occurs, when it occurs and how fiercely it burns. In this work, we investigated how fire regimes emerge in the Fynbos ecosystem and how the invasions of Acacias affect the fire regime in Fynbos ecosystem to Acacias favour. We build a mathematical model to describe the dynamics of Fynbos and fire before and after the invasion of Acacias in Fynbos ecosystem. We assumed that Fynbos and Acacia life cycle include seeds, seedling and adult stage. Fire dynamics in Fynbos ecosystem before and after the invasion of Acacias was presented as a predator-prey model where we treated fire as a predator, adult Fynbos and Acacias as the prey [1]. For simplicity in our model after the invasion we only considered the competition between seeds, seedling and matured stage for both Acacias and Fynbos. We used stability and bifurcation analysis to detect the regime shift of fire in Fynbos ecosystem from the invasion of Acacias.

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