

The genesis of giants: behavioral, social, and vocal development of northern elephant seals

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To identify the conditions that support the development of hierarchical relationships within networks of familiar competitive rivals, we consider the ontogeny of area use, social relationships, and communicative behavior among male northern elephant seals (*Mirounga angustirostris*). We cross-sectionally sampled the behavior of 207 males during reproductive development on the breeding colony at Año Nuevo, CA to determine (1) whether space utilization changes as a function of age, (2) how social relationships vary across different age classes, and (3) the structural development of their ritualized acoustic displays. As males mature, space use within the breeding colony decreases, creating a more predictable social environment in which repeated interactions promote greater connectivity between individuals. Additionally, the vocalizations of sub-adult males transition from highly variable and unstructured to stable adult calls that reliably convey individual identity. The emergence of these acoustic signatures during a profound period of physical development – along with concurrent changes in movement patterns – coincides with the establishment of stable relationships between mature competitors. These findings indicate that ontogenetic changes in male behavior can be important determinants of adult position within structured hierarchies, and provide insight into the role of behavioral development in species that exhibit intense competition for access to resources.