Fig. S1. Diagram of measurements used to categorize body shape.

SL is standard length. HH is head height from the highest point on the neurocranium to the ventral surface of the fish. MH is maximum height.

Supplementary Materials and Methods

Using a pruned version of the phylogenetic tree from the fish tree of life project (Rabosky et al., 2018) and open-source data (Sayer and Davenport, 1991; Wright and Turko, 2016) we categorized 220 fish species in terms of body shape, activity level, active anatomy, behavior and skin anatomy (Table 2; detailed variable calculation methods listed below). We then used the r packages ape, phytools, ggplot2 and cowplot to visualize our data (https://github.com/StandenLab/LutekJEB2022; Paradis and Schliep, 2019; Revell, 2012; Wickham et al., 2016). We were able to find information for all five of our categorical variables for 160 species of fishes representing 62 genera. For ease of visualization, we plot only genera in the tree, but use the full species list for the histogram plots (Fig. 3). The full list of species along with their classifications can be found in Table S1.

Body shape represents the overall shape of the body, primarily from a lateral view. Categories were based on measurements of the lateral silhouette of the animal (Figure S1, Table 2). The fusiform and tadpole categories were determined by aspect ratio (AR- maximum body

height:standard length; MH:SL), and head height (HH). Tadpole shaped fish have an AR < 5, and a head height that is equal to or larger then 92.5% MH. Fusiform fish either have an AR < 4, or have an AR < 5.5 and a head height that is smaller then 85% MH. The long, elongate, and eel-like categories were determined by AR. Long fish have an AR between 4.0-6.8, elongate fish between 6.8-8.5, and eel-like fish greater then 8.5. These three categories are not streamlined like fusiform fish and have a larger number of dorsal fin spines and vertebrae. Though all could be categorized as "elongate," we chose to separate them into three categories because the variation in aspect ratio was so great.

Behaviour describes the main mode of locomotion fish tend to use on land. Though many of these species are capable of multiple forms of terrestrial locomotion, they are most often observed moving using a preferred technique.

Active Anatomy describes the part of the body (axial, appendicular, or both) used most during terrestrial locomotion. These categories were defined in (Pace and Gibb, 2014). Axial describes locomotion using some portion of the long axis of the body (head, abdomen, tail, etc). Appendicular describes locomotion using the fins. Both describes motion using both the fins and some portion of the long axis of the body. Again, species can move using more than one mode of locomotion, but we categorized them based on preferred mode reported in the literature.

Activity Level describes how active fish are when they are on land. Categorizations and species were taken directly from supplementary material in Wright and Turko (Wright and Turko, 2016). We included additional species reported to locomote over land using Wright and Turko's three categories, fish that actively emmerse (***active***), fish that do not emmerse actively, but are often stranded out of water and can survive for a time on land (***remains***), or fish that are observed to emerse actively or become stranded, with equal frequency (**both**). Note: fish in the "**both**" category tend to be less active on land then fish in the "**active**" category.

Skin Anatomy is the main structure of the most exterior surface of the fish. This part of the body interacts with the substrate during locomotion and can be essential to respiration on land. Fish fall into three categories. Species in the **skin** category have scattered or no scales or other external structures. The main surface that interacts with the substrate is skin. Fish in the **scales** are covered in cycloid or ctenoid scales. These flexible scales tend to overlap and cover the entire body. Fish in the **armour** category are covered in ganoid scales, cosmoid scales, or scutes. These structures tend to be less flexible, much denser, and interlocking as opposed to overlapping.

Table S1. Phylogeny data.

Click here to download Table S1

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