The life of the tropics, so far as the fishes are concerned, offers analogies to the life of cities, viewed from the standpoint of human development. In the same way, the other regions under consideration are, if we may so speak, a sort of ichthyological backwoods. In the cities, in general, the conditions of individual existence are most easy, but the competition is most severe. The struggle for existence is not a struggle with the forces and conditions of nature. It is not a struggle with wild beasts, unbroken forests, or a stubborn soil, but a competition between man and man for the opportunity of living.

It is in the cities where the influences which tend to the modernization and concentration of the characters of the species, the intensification of human powers and their adaptation to the various special conditions, go on most rapidly. That this intensification is not necessarily progress, either physically or morally, is aside from our present purpose.

It is in the cities where those characters and qualities not directly useful in the struggle for existence are first lost or atrophied. Conversely it is in the "backwoods," the region most distinct from human conflicts, where primitive customs, antiquated peculiarities, and useless traits are longest and most persistently retained. The life of the backwoods will be not less active and vigorous, but it will lack specialization.

It is not well to push this analogy too far, but we may perhaps find in it a suggestion as to the development of the eels. In every city there is a class which partakes in no degree of the general line of development. Its members are specialized in a wholly different way, thereby taking to themselves a field which the others have abandoned, and making up in low cunning what they lack in strength and intelligence. Thus among the fishes we have in the regions of closest competition a degenerate and non-ichthyized form, lurking in holes among rocks and creeping in the sand, thieves and scavengers among fishes. The eels fill a place which would otherwise be left unfilled. In their way, they are perfectly adapted to the lives they lead. A multiplicity of vertebral joints is useless to the typical fish, but to the eel strength and suppleness are everything, and no armature of fin or scale or bone so desirable as its power of escaping through the smallest opening.

It may be too that, as rovers in the open sea, the strong swift members of the mackerel family find a positive advantage in the possession of many vertebræ, and that to some adaptation to their mode of life we must attribute their lack of ichthyization of the skeleton. But this is wholly hypothetical, and we may leave the subject with the general conclusion that with the typical fish advance in structure has specialized the vertebræ, increased their size and the complexity of their appendages, while decreasing their numbers; and that, with some exceptions and modifications, this reduction is characteristic of fishes in the tropics, and that it is so because in the tropics the processes of evolution are most active, so far as the fishes are concerned.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Fair-Weather Echoes.

MY dog, a deep-voiced Newfoundlander, has one plague in life — an echo. It comes from a cottage some three hundred yards off, and there that "other dog" will always have the last word. This is exasperating, and "Graph" —he is named after another sound-producer, the graphophone — gives vent to his anger in a series of short, sharp, threatening yelps, which are of course more distinctly reproduced than the long bow-wows and howls. Last night Graph was very noisy, but the echo was silent. I tried to rouse it, and excited Graph to do his utmost, but with no effect. A moderate, even-down rain was falling, and the fair-weather echo would not venture out. There is, of course, a reason for this, but I had never noticed the fact before. Is the explanation that the lines of rain cut through the aerial sound-waves and stop them? Are echoes among the hills interfered with by rain?

When the shower was over I tested the echo again, and there it was, a little fainter than usual, but persistent as ever.

A. M. B.

Colonial Beach, Va., Aug. 13.

Number of Words in an Ordinary Vocabulary.

IN examining the vocabularies of children, my interest in the size and nature of the vocabulary of an ordinary person, previously aroused by the varying statements and estimates I have seen, was excited sufficiently to induce me to spend a portion of my vacation in making some investigations, the results of which may be of interest to the readers of *Science*.

I first turned to Webster's Unabridged Dictionary (edition of 1870), and counted the words on every twenty-fifth page, and found the percentage of them whose meaning was known to me. Then by calculation I found that if the same percentage holds for the other pages I must know the meaning of nearly seventy thousand of the words given in that edition of the dictionary. Since in the dictionary a word as a transitive verb, as an intransitive verb, as a noun, as an adjective, as an adverb, is separately defined, as well as when used with a prefix, a suffix, or in a compound; and since the irregular plurals, adjectives irregularly compared, and the parts of irregular verbs are also given, this number is perhaps twice that of the really different words. The meaning of some of these words was readily divined from their form, although they had never been seen. On the other hand, one word not unfrequently has a dozen different shades of meaning, several of which often require as different and definite associations as entirely distinct words. Hence the effort required to learn all of these words, with their different shades of meaning, but similar form, is probably as great as it would be to have seventy thousand different words, each having but one meaning. I did not understand the meaning of all of the words well enough to define and use them with accuracy, but merely well enough to grasp their meaning in any sentences in which they might be used, and I probably have never actually used a fourth of them. But, besides the words in the dictionary and some new words given in later editions, and a number of words and phrases from other languages in common use, there are probably several thousand proper names, such as are found in history, geography, fiction, and among acquaintances, each with its distinct associations, familiar to every intelligent person. These words will more than make up for any error in counting that I could have made.

Professor E. S. Holden (Trans. Philol. Soc., 1877), found his own vocabulary to be between thirty-three and thirty-four thousand words, and estimated that of an ordinarily intelligent person at twenty-five thousand. I do not know what he called a word, nor whether he counted as known words that he could not or did not use. He estimates that the vocabulary of technical terms possessed by a specialist may reach ten thousand or more. In "Gray's Structural Botany" there is a glossary of between two and three thousand technical terms, the vast number used in cryptogamic botany not being included in the list, and of course none of the special names of plants, so it is not improbable that a well-read botanist may have a technical vocabulary of ten thousand words, and a zoologist a greater number.

The words in common use by the ordinary individual has been estimated at from one to three thousand, and it is claimed that when one has learned the meaning of that many words he can carry on any ordinary conversation or understand common, gen-