available. Approximately 33 percent were X category, 25 percent were Y, 6 percent were W, and about 40 percent were unclassified. All cells had input from the 555-nm cone system. More than 85 percent had inputs from the 500-nm cone system. Approximately 50 percent had input from the 450-nm cone system. No striking patterns have yet been identified in the distribution of any particular cone system among the on-center or off-center types in each category.
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The Photographic Determination of Group Size, Composition, and Stability of Coastal Porpoises (*Tursiops truncatus*)

Abstract. *During a 21-month study, 53 individual bottle-nosed porpoises were recognized by photographs of their dorsal fins. They traveled in small subgroups (mean size = 15) composed of a stable core of five animals plus other individuals that varied greatly from sighting to sighting.*

Little research has been done on the group composition and dynamics of wild porpoises (*1*). This lack results in part from the difficulty of sighting and resighting porpoise groups in the open ocean, and in part from the difficulty of identifying individuals within a group. While studying South Atlantic bottle-nosed porpoises (*Tursiops truncatus*), which periodically came within sighting distance of the Argentine coast (42°23′S, 64°3′ W), we developed a simple photographic technique to record individuals by their natural markings.

The trailing edge of a bottle-nosed porpoise's dorsal fin is very thin and is readily tattered during the animal's life. Since this tissue apparently does not regenerate, prominent nicks and scars that have lasted more than 2 years are seen on almost all animals (Figs. 1 and 2). As well, pigment spots and bite marks made by conspecifics are often found on the dorsal fin and elsewhere, but these usually last for only about 6 months to 1 year.

From August 1974 through March 1976, *T. truncatus* passed by our land observation point on 191 of 433 days on which observations were made. On approximately 150 days, we took 35-mm still camera photographs (with lenses ranging from 50 mm to 1000 mm in size) of individual porpoises from land, from a small rubber boat (3.5-meter Zodiak), or both. We took more than 15,000 photographs, from which we identified 53 ani-

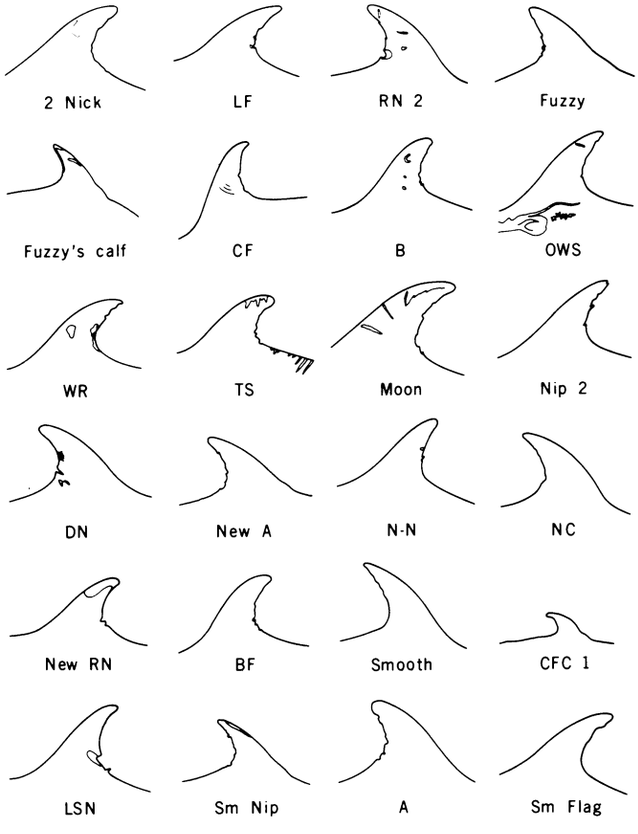
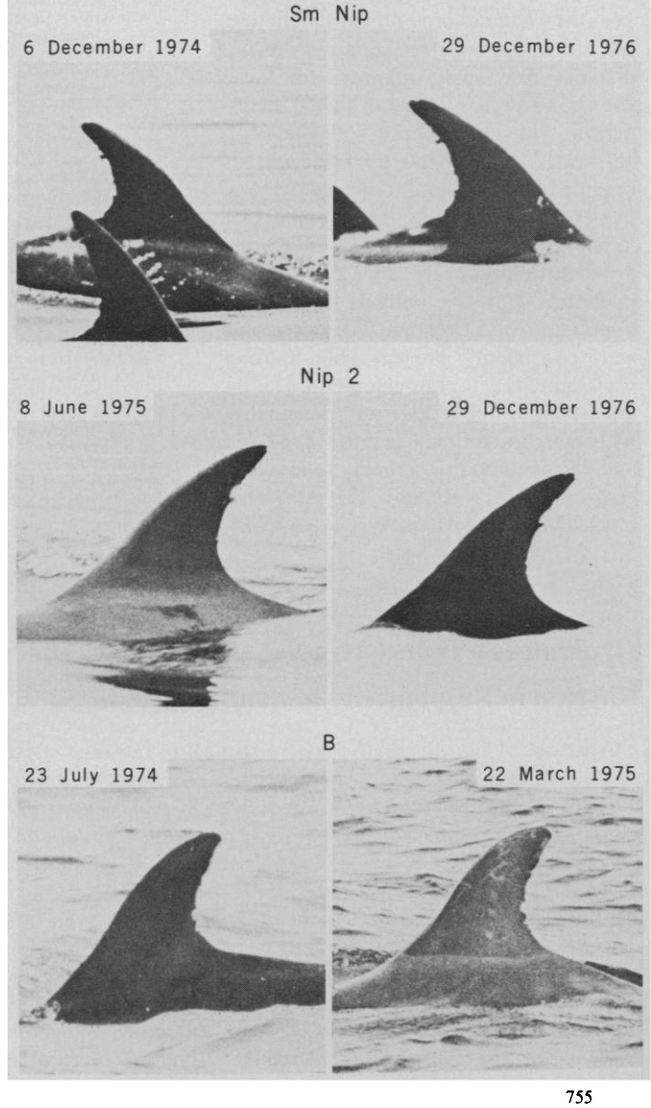


Fig. 1 (left). A sample of 24 fin variations found within the population. Lines within the fin boundaries represent light pigment spots or scar tissue. Fig. 2 (right). Three individual porpoises followed photographically through time. Compare these fins with the corresponding line drawings of Fig. 1. The fin shape and trailing edge nicks appear to be relatively stable.



mals by variations in their dorsal fins. During 35 of the 150 days, we obtained enough good fin photographs of each individual (at least four per animal) to be certain that all within the group had been recorded. In this manner we were able to study not only exact group size (as opposed to estimates of group size, which have traditionally been made on porpoises), but group composition over time as well. The size of the group varied between 8 and 22 ($\bar{X}$ = 15, standard deviation = 3.28). Throughout the 21-month study, five animals were always present when the group was sighted. Six others were present until October 1975, at which time they disappeared and five new porpoises took their place. The six no longer sighted near our study area after October 1975 were spotted 6 months later within a new group, at a distance from our study area of more than 300 km. Four of these six animals were again found in the study area in December 1976, 9 months after completion of the 21-month continuous study. Although we do not know when during the 9 months they moved back to their original site, they had covered an extremely long round-trip distance (at least 600 km), a distance previously unknown for these coastal porpoises. Other of the 53 identified individuals appeared with the original "core" unit of five for brief periods ranging from several days to several months and then disappeared again.

The evidence represents an interesting group structure for this species of marine mammal. Only five animals of a partial population of 53 recognized individuals were consistently present when a group was sighted. The interchange of 11 others during October 1975 and the fluidity with which additional animals appeared and disappeared (presumably to join other groups), far surpasses the individual interchanges between known "open" groups of most terrestrial mammals (*2*). It appears that a redefinition of "group" for this population may be more in line with the generally accepted group concept. Thus, we may regard the 53 known animals as part of the same group, while those sighted at any one time, numbering 8 to 22, actually represent subgroups or bands within the main unit. The composition of these subgroups, except for the relatively stable units described, changes greatly. Whether or not the more stable units of five and six animals represent kinship ties is not known.

Because many different porpoise species are periodically found close to shore in different parts of the world (*3*), we believe that this photographic technique would be useful in other areas.

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Hyperalgesia Induced by Naloxone Follows Diurnal Rhythm in Responsivity to Painful Stimuli

Abstract. *A diurnal rhythm was observed in the responsiveness of mice to nociceptive stimuli and in the hyperalgesic activity of naloxone. These rhythms may follow a diurnal rhythmicity in the activity of endogenous opioid peptides and may partly account for previous controversy over the direct action of naloxone in opiate-naive animals.*

Evidence is growing that the recently discovered endorphins, endogenous peptides with opioid activity (*1*), have physiological roles as hormones or neurotransmitters (*2*). They may function in nociception and neuroendocrine regulation and even influence complex mood and behavior (*2*). The suggestion of a physiological role for these substances seemed to demand that naloxone, a pure narcotic antagonist, should have direct pharmacological activity in opiate-naive subjects. Naloxone, however, has been generally considered to have no significant pharmacological activity other than what results from antagonism of exogenous opiates, and this presumed fact has been used as an argument against the likelihood of existence of endogenous opioid ligands (*3*). Even with the recent demonstration that endogenous opioid ligands do indeed occur in brain, the controversy concerning the hyperalgesic activity of naloxone has continued. The lack of such activity has been reported (*3, 4*), and the antagonism by naloxone of the analgesia produced by electrical stimulation of the periaqueductal gray matter (*5*) has also been questioned (*6*). Jacob *et al.* (*7*), nevertheless, have reported a lowering of response latencies by naloxone in the mouse hot-plate test, and we have also observed hyperalgesic activity of naloxone in both the rat flinch-jump (unpublished observations) and mouse hot-plate tests (*8*). We noticed, however, that positive results were not always reproducible but were dependent on the specific response measured and the conditions of the experimental situation. Others have also assumed that naloxone would be expected to have hyperalgesic effects only when the endogenous opioid peptide system was activated (*4, 9*).

In our studies we noticed that the baseline latencies in the mouse hot-plate test showed significant increases from early morning to late afternoon. Diurnal rhythms in the analgesic activity of morphine (*10*) and in the hypothalamic control of neuroendocrine activity (*11*) have been reported. Since endorphins have been implicated in the regulation of nociception and neuroendocrine activity, a rhythm in such endogenous opioids could provide an explanation for these observations and, furthermore, might provide an explanation for the conflicting results concerning the hyperalgesic activity of naloxone. We have observed a diurnal rhythm in responsivity of mice to nociceptive stimuli and in the hyperalgesic activity of naloxone, which might reflect a rhythm in endogenous opioids. A preliminary account of this work has been reported (*12*).

In our studies we used Cox standard mice (20 to 23 g, about 5 weeks old, Harlan Industries) that were raised and maintained on a lighting schedule which consisted of lights on from 0600 to 1800 hours, and lights off from 1800 to 0600 hours. The mice either had continued access to food and water or were deprived for 2 to 6 hours before testing. We detected no difference in the results obtained whether or not the animals had